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COMMONWEALTH of VIRGINIA
Office of the Attorney General

Jason S. Miyares
Attorney General

202 N. Ninth Street
Richmond, Virginia 23219
804-786-2071
FAX 804-786-1991
Virginia Relay Services
800-828-1120
7-1-1

March 25, 2022

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State Corporation Commission
P.O. Box 2118
Richmond, Virginia 23218

RE: ***Application of Virginia Electric and Power Company, For approval and certification of the Coastal Virginia Offshore Wind Commercial Project and Rider Offshore Wind, pursuant to § 56-585.1:11, § 56-46.1, § 56-265.1 Et seq., and § 56-585.1 A6 of the Code of Virginia***
Case No. PUR-2021-00142

Dear Counsel:

Please find attached for filing in the above-referenced matter, the testimony and exhibits of Mr. D. Scott Norwood filed on behalf of the Office of Attorney General, Division of Consumer Counsel.

Yours truly,

/s/ C. Meade Browder Jr.

C. Meade Browder Jr.
Senior Assistant Attorney General

Enclosure

cc: SCC Document Control Center (electronic filing)
Service List

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing was served on March 25, 2022, by electronic service to:

K. Beth Clowers, Esquire
Frederick D. Ochsenhirt, Esquire
State Corporation Commission
Office of General Counsel
P. 0. Box 1197
Richmond, VA 23218
Beth.Clowers@scc.virginia.gov
Frederick.Ochsenhirt@scc.virginia.gov

David J. DePippo, Esquire
Paul E. Pfeffer, Esquire
Lisa R. Crabtree, Esquire
Dominion Energy Services, Inc.
120 Tredegar Street, RS-2
Richmond, VA 23219
david.j.depippo@dominionenergy.com
paul.e.pfeffer@dominionenergy.com
lisa.r.crabtree@dominionenergy.com

S. Perry Coburn, Esquire
Timothy G. McCormick, Esquire
Dannieka N. McLean, Esquire
Christian Barton
901 East Cary Street
Suite 1800
Richmond, VA 23219
pcoburn@cblaw.com
tmccormick@cblaw.com
dmclean@cblaw.com

William C. Cleveland, Esquire
Claire Horan, Esquire
Southern Environmental Law Center
201 West Main Street
Charlottesville, VA 22902
wcleveland@selcva.org
choran@selcva.org

Marion Werkheiser, Esquire
Cultural Heritage Partners, PLLC
1811 East Grace Street, Suite A
Richmond, VA 23223
marion@culturalheritagepartners.com

Vishwa B. Link, Esquire
Joseph K. Reid, III, Esquire
Jennifer D. Valaika, Esquire
Timothy D. Patterson, Esquire
April M. Jones, Esquire
McGuire Woods, LLP
Gateway Plaza
800 East Canal Street
Richmond, VA 23219
vlink@mcguirewoods.com
jreid@mcguirewoods.com
jvalaika@mcguirewoods.com
tpatterson@mcguirewoods.com
amjones@mcguirewoods.com

Carrie H. Grundmann, Esquire
Spilman Thomas & Battle, PLLC
110 Oakwood Drive
Suite 500
Winston-Salem, NC 27103
cgrundmann@spilmanlaw.com

Barry A. Naum, Esquire
Spilman Thomas & Battle, PLLC
1100 Bent Creek Boulevard
Suite 101
Mechanicsburg, PA 17050
bnaum@spilmanlaw.com

Matthew L. Gooch, Esquire
William T. Reisinger, Esquire
ReisingerGooch PLC
1108 East Main Street
Suite 1102
Richmond, VA 23219
matt@reisingergooch.com
will@reisingergooch.com

Cale Jaffe, Esquire
Stephen Wald, Esquire
University of Virginia School of Law
cjaffe@law.virginia.edu
SW2DP@virginia.edu

/s/ C. Meade Browder Jr.
Counsel

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC AND POWER COMPANY

CASE NO. PUR-2021-00142

For approval and certification of the Coastal Virginia Offshore Wind Commercial Project and Rider Offshore Wind, pursuant to § 56-585.1:11, § 56-46.1, § 56-265.1 *et seq., and* § 56-585.1 A6 of the Code of Virginia

DIRECT TESTIMONY OF SCOTT NORWOOD

ON BEHALF OF
THE OFFICE OF THE ATTORNEY GENERAL
DIVISION OF CONSUMER COUNSEL

MARCH 25, 2022

Summary of Testimony
D. Scott Norwood

Mr. Scott Norwood presents testimony addressing his findings and recommendations regarding VEPCO's application for approvals of the Company's proposed Coastal Virginia Offshore Wind Commercial Project ("CVOW Project" or "Project") and Rider Offshore Wind ("Rider OSW").

Apart from the legislative policy preferences expressed in the 2020 Virginia Clean Economy Act for the CVOW Project, Mr. Norwood's analysis finds that

(1) the $9.8 billion CVOW Project is not needed to serve the Company's system capacity requirement through at least 2035;

(2) the capital costs are approximately 2 to 3 times the cost of solar resources; and

(3) VEPCO's forecasted economic benefits of the Project are based on a cost/benefit analysis ("CBA") that overstates the benefits, which remain within the margin of error for a 34-year forecast of utility system costs.

Notwithstanding Mr. Norwood's reservations regarding the need for and high cost of the CVOW Project, he acknowledges that the Virginia General Assembly has declared that utility-owned offshore wind electric generation facilities are to be in the public interest, and that the law directs that the Commission to give due consideration to economic development and social cost of carbon benefits of the Project.

In consideration of the high fixed cost of the CVOW Project and the significant risks posed to customers, if approved, Mr. Norwood recommends that VEPCO be required to file periodic status reports, similar to the requirement for the Virginia City Hybrid Energy Center, that address the performance and cost of the Project through the construction period and for at least the first year of commercial operations.

He further recommends that the Commission cap the cost of the CVOW Commercial Project and related interconnection facilities at the Company's $9.8 billion estimated cost level presented in this case (which already includes hedging and contingencies), and that the capital, O&M costs and operating performance of the CVOW facility be subject to minimum standards that reasonably reflect the assumed costs and performance level (42% capacity factor) reflected in the Company's CBA for the Project, as measured on a rolling 3-year average basis.

Additionally, the Commission should have the Company publicly commit to in-service dates for the CVOW Project. In the event that the Company has reasonable belief that an in-service date is going to be delayed by more than 6 months or that the $9.8 billion estimated cost of the Project will be exceeded by 5% or more, the Commission should require that the Company make an immediate filing with the Commission that provides notice of the delay or cost increase, provides an explanation of the reasons for the delay or cost increase, and which reopens the question of prudence in light of the delay in scheduled in-service dates or Project cost overruns.

CASE NO. PUR-2021-00142

DIRECT TESTIMONY OF SCOTT NORWOOD

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EXHIBITS

I. INTRODUCTION

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

A. My name is Scott Norwood. I am President of Norwood Energy Consulting, L.L.C. My business address is P.O. Box 30197, Austin, Texas 78755-3197.

Q. WHAT IS YOUR OCCUPATION?

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

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I am an electrical engineer with over 37 years of experience in the electric utility industry. I began my career as a power plant engineer for the Austin Energy where I was responsible for electrical maintenance and design projects for three gas-fired power plants. In January 1984, I joined the staff of the Public Utility Commission of Texas ("PUCT") where I was responsible for evaluating and submitting testimony regarding resource planning, fuel and purchased power cost recovery, and power plant certification applications filed with the PUCT. Since 1986 I have provided utility regulatory consulting, resource planning, and power procurement services to public utilities, electric consumers, industrial interests, municipalities, and state government clients. I have testified in over 200 utility regulatory proceedings over the last 20 years, before state regulatory commissions in Alaska, Arkansas, Florida, Georgia, Illinois, Iowa, Kentucky,

Louisiana, Michigan, Missouri, New Jersey, Ohio, Oklahoma, Texas, Virginia, Washington, and Wisconsin.[1]

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

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

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE STATE CORPORATION COMMISSION?

A. Yes. I have testified on behalf of Consumer Counsel in numerous past regulatory proceedings before the Virginia State Corporation Commission ("Commission"), including cases involving electric restructuring, integrated resource planning ("IRP"), base rate increases, fuel cost recovery, power plant certification, grid enhancement and renewable energy program proposals. I have testified on behalf of Consumer Counsel in such cases involving Virginia Electric and Power Company, d/b/a Dominion Energy Virginia ("VEPCO" or "Company").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to present my findings and recommendations regarding VEPCO's application for approval and certification of the Company's proposed Coastal Virginia Offshore Wind Commercial Project ("CVOW Project" or the "Project") and Rider Offshore Wind ("Rider OSW").

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

A. Yes. I have prepared 8 exhibits, which are attached to my testimony.

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[1] See Exhibit SN-1 for additional details on my background and experience.

II. VEPCO'S CVOW PROJECT

Q. PLEASE DESCRIBE VEPCO'S PROPOSED CVOW PROJECT.

A. The CVOW offshore wind generation project consists of 176 Wind Turbine Generators rated at 14.7 megawatts ("MW") with a combined nominal nameplate capacity of 2,587 MW to be located at a federal lease site approximately 27 miles off the coast of Virginia Beach, Virginia.[2] The CVOW Project also includes certain offshore and onshore interconnection and transmission facilities (the "Virginia Facilities") for the export of electricity produced from the Project to the Harpers Switching Station at Naval Air Station Oceana, which is the planned point of interconnection ("POI") of the Project to the PJM system.

Q. WHAT IS THE ESTIMATED COST OF THE CVOW PROJECT?

A. VEPCO's current estimate is that the total cost of the CVOW Project will be $9.8 billion, excluding financing costs, including approximately $1.15 billion for the Virginia Facilities.[3] The Company had estimated the cost in 2019 to be $7.8 billion. The current estimate equates to an installed cost of approximately $11,500/kW based on the Company's projected firm capacity rating of the Project during the first year of service. This cost is more than recent public cost estimates for a new nuclear plant and 2-3 times more expensive than capital cost estimates for new solar or wind generating facilities. Although the forecasted capacity factor of the CVOW Project is higher than what is

[2] Application at 7 and Mitchell Direct Testimony at 1.

[3] Application at 18 and Mitchell Direct Testimony at 6-7.

expected for new solar generation, the $87/MWh Levelized Cost of Energy ("LCOE") for the CVOW Project is more than double the LCOEs for solar renewable resources (~$36/MWh) and solar power purchase agreements ("PPAs"), which typically have price terms that charge customers only for the energy that is delivered. In contrast to PPAs, for utility-owned renewable resources such as the proposed CVOW Project, customers must pay charges which recover the full cost of the project even if no energy is provided (due to an extended outage) or if energy supplied is much lower than the energy production level assumed to justify the Project.

Q. WHAT IS THE COMPANY'S EXPECTED IN-SERVICE DATE AND SERVICE LIFE OF THE WIND GENERATION PORTIO OF THE CVOW PROJECT?

A. The expected in-service date of the CVOW Project is August 2025 continuing through year 2026, and the estimated service life of the generation project is 30 years.[4]

Q. WHAT IS THE FORECASTED ANNUAL ENERGY PRODUCTION OF THE CVOW PROJECT?

A. VEPCO forecasts that annual energy production of the CVOW Project will be approximately 9,500 gigawatt-hours ("GWh"). This equates to a 41.9% average net annual capacity factor based on the Project's 2,587 MW nameplate capacity rating. The CVOW Project firm capacity rating is estimated by the Company to average 784 MW (30% of the nameplate rating) over the 30-year life of the project.[5]

[4] Application at 15 n.13 and Kelly Direct Testimony at 12.

[5] Source of data is VEPCO's response to AG 2-005.

Q. WHAT IS THE ESTIMATED REVENUE REQUIREMENT AND RATE IMPACT OF THE CVOW PROJECT?

A. The annual revenue requirement for the CVOW Project is $78.7 million for the Rate Year beginning September 1, 2022.[6] VEPCO states that the expected rate impact of proposed Rider OSW on a residential customer's monthly bill is $1.45 based on 1,000 kW monthly usage.[7] Dominion has projected the Rider OSW monthly charge on a residential bill to reach more than $20, and $81 for a small commercial customer by year 2027.[8]

Q. WHAT RELIEF IS VEPCO REQUESTING FOR THE CVOW PROJECT IN THIS CASE?

A. Among other things, VEPCO is requesting that the Commission:

- Find that the Company has complied with the requirements for an offshore wind project set forth in Va. Code § 56-585.1:11 C 1 for purposes of the presumption that the costs are reasonably and prudently incurred;
- Determine that the Company's Foreign Currency Risk Mitigation Plan is reasonable and prudent, as soon as procedurally possible;
- Approve, pursuant to Va. Code § 56-46.1, the construction of the Virginia Facilities;
- Grant a certificate of public convenience and necessity for the Virginia Facilities under the Utility Facilities Act, Va. Code§ 56-265.1 *et seq.*
- Approve the proposed Rider OSW under Va. Code § 56-585.1 A 6 subject to future Rider OSW proceedings and true-ups, effective for usage on and after September 1, 2022; and
- Approve the proposed revenue requirement, cost allocation, rate design, and accounting treatment for the CVOW Project for the Rate Year September 1, 2022, through August 31, 2023

[6] See VEPCO's Petition at 21.

[7] Petition at 21.

[8] See Ex. SN-2 (Consolidated Bill Analysis from RPS Case)

Q. WHAT ARE THE STATUTORY REQUIREMENTS FOR DEVELOPMENT OF OFFSHORE WIND PROJECTS IN VIRGINIA?

A. I understand that § 56-585.1:11 C 1, enacted by the 2020 Virginia Clean Economy Act ("VCEA") declares the CVOW Project to be in the public interest and establishes a presumption of prudence for the costs of the CVOW Project. "[S]uch costs shall be presumed to be reasonably and prudently incurred if the Commission determines that:

> (i) the utility has complied with the competitive solicitation and procurement requirements pursuant to subsection E;
>
> (ii) the project's projected total levelized cost of energy, including any tax credit, on a cost per megawatt hour basis, inclusive of the costs of transmission and distribution facilities associated with the facility's interconnection, does not exceed 1.4 times the comparable cost, on an unweighted average basis, of a conventional simple cycle combustion turbine generating facility as estimated by the U.S. Energy Information Administration in its Annual Energy Outlook 2019; and
>
> (iii) the utility has commenced construction of such facilities for U.S. income taxation purposes prior to January 1, 2024, or has a plan for such facility or facilities to be in service prior to January 1, 2028.

I further understand that the "Commission shall disallow costs, or any portion thereof, only if they are otherwise unreasonably and imprudently incurred." In reviewing this Application the Commission is to "give due consideration to (a) the Commonwealth's renewable portfolio standards and carbon reduction requirements, (b) the promotion of new renewable generation resources, and (c) the economic development benefits of the project for the Commonwealth, including capital investments and job creation."

Q. DO THE COMMISSION'S RULES ADDRESS THE REQUIREMENTS FOR UTILITIES TO DEMONSTRATE THE PRUDENCE OF MAJOR GENERATION INVESTMENTS SUCH AS THE CVOW PROJECT?

A. Yes. The Commission's Rate Case Rules, 20 VAC 5-204-5, *et seq.*, require that VEPCO provide certain information in Schedule 46 when proposing new rate adjustment clauses and seeking prudency determinations. In general, the Rules require that utilities demonstrate prudence by showing that the proposed resources: 1) are needed; 2) have reasonable costs as supported by cost/benefit analyses and other information; and 3) are the best alternative when compared to available options.

- For any § 56-585.1 A 5 or A 6 RAC, the Company must provide key documents supporting the projected and actual costs that the applicant seeks to recover through the rate adjustment clause, such as economic analyses, contracts, studies, investigations, results from requests for proposals, cost benefit analyses, or other items supporting the costs (Schedule 46b.1.iv.).

- For any § 56-585.1 A 6 proposal, the Company must provide information relative to the need or justification for the proposed generating unit. Economic studies that compare the selected alternative with other options considered, including sensitivity analyses and production costing simulations of the applicant's overall generating resources that demonstrate that the selected option is the best alternative (Schedule 46b.2.v)

- Finally, in any case involving a prudency determination under § 56-585.1 the Company must provide detailed explanation of the justification for the proposed costs and key documents supporting the projected and actual costs of the project for which the applicant seeks a prudency determination, such as economic analyses, support used by senior management for major cost decisions as determined by the applicant, contracts, studies, investigations,

results from requests for proposals, cost-benefit analyses, and other items supporting the costs (Schedule 46d.1 and 2).

Q. HAS VEPCO PROVIDED INFORMATION TO MEET THE ABOVE REQUIREMENTS TO ADDRESS PRUDENCE OF THE PROPOSED CVOW PROJECT?

A. Yes. VEPCO indicates that the direct testimony of Company witnesses Joshua Bennett and Glenn Kelly and the information provided in the Generation Appendix filed with the Application support the prudence of the generation portion of the proposed CVOW Project.[9] In addition, VEPCO has presented a cost/benefit analysis ("CBA") that compares costs of a scenario including the CVOW Project to costs of an alternative scenario that does not include the CVOW Project over the 34-year (2022-2056) CBA study period.[10] The Company claims that this economic analysis demonstrates that CVOW is expected to provide a $2.5 billion cumulative NPV benefit to customers, which includes the Company's estimated $3.2 billion Social Cost of Carbon ("SCoC") benefit of the Project.[11]

Q. WHAT ISSUES ARE ADDRESSED BY REMAINING SECTIONS OF YOUR TESTIMONY?

A. My testimony addresses VEPCO's analysis of the statutory presumption LCOE requirement, the need for and prudence of the CVOW Project, the reasonableness of the Company's CBA including the SCoC benefit estimate for the Project, and the reasonableness of the Company's proposed Rider OSW charges.

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[9] Application at 21-24.

[10] See VEPCO's Petition at 15.

[11] See Kelly Direct Testimony at 15.

III. STATUTORY PRESUMPTION

Q. WHAT IS THE LEVELIZED COST TEST APPLICABLE TO THIS PROJECT?

A. As stated above, in 2020, the General Assembly and the Governor created the statutory presumption that the CVOW project is prudent, provided that, among other things, the CVOW Project has a projected total LCOE that does not exceed 1.4 times the comparable cost, on an unweighted average basis, of a conventional simple cycle combustion turbine generating facility as estimated by the U.S. Energy Information Administration ("EIA") in its Annual Energy Outlook 2019. The 2019 EIA estimate as to what it would cost to bring a conventional combustion turbine ("CT") into service by 2023 was $89.30 per megawatt hour. Applying the 1.4x factor results in an LCOE test amount of $125.02.

Q. HAS THE COMPANY PROJECTED AN LCOE FOR THE CVOW PROJECT?

A. Yes. The Company estimates that the CVOW LCOE is $87 per MWh.[12]

Q. ARE THERE ANY DIFFERENCES IN SERVICE LIFE ASSUMPTIONS USED FOR THE EIA'S LCOE CALCULATION WHEN COMPARED TO VEPCO'S LCOE CALCULATION FOR THE CVOW PROJECT?

A. Yes. For example, EIA uses a 25-year operating life for developing the LCOE for offshore wind, while VEPCO has used a 30-year service life for calculating the CVOW LCOE.[13] This 30-year service life has not been demonstrated and is not guaranteed. In general, longer service life assumptions serve to reduce forecasted LCOEs for a given generating asset.

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[12] See Bennet Direct Testimony at 19.

[13] See Exhibit SN-9.

Q. DO YOU HAVE ANY OTHER CONCERNS WITH INPUT ASSUMPTIONS USED FOR VEPCO'S LCOE CALCULATION FOR THE CVOW PROJECT?

A. Yes. The Company's LCOE analysis assumes that it will make market sales of renewable energy certificates ("RECs") that will be generated by the CVOW Project, which offsets the projects' cost and thereby serves to lower the reported LCOE. For purposes of the LCOE test, the Company is projecting a $9 per MWh REC sale price.

Q. HAS VEPCO STATED WHAT IT PLANS TO DO WITH RECS GENERATED BY ITS RPS ELIGIBLE RESOURCES?

A. Yes. The Company states that it needs the RECs generated by the CVOW Project to comply with its RPS requirements.[14] My understanding is that once VEPCO uses a REC to comply with the RPS requirements, that same RECs cannot be sold to third parties for purposes of offsetting the project costs.

Q. WHAT IS THE IMPACT ON THE PROJECTED LCOE IF A 25-YEAR SERVICE LIFE IS USED AND THE REC SALES ARE REMOVED FROM THE LCOE ANALYSIS?

A. The projected LCOE of the CVOW Project would increase to approximately $100 per MWh if the assumed life is shortened to 25 years and the Company's proposed REC sales credit is removed from the calculation. While this revised CVOW Project LCOE is still below the $125.02 per MWh LCOE test for the rebuttable presumption of prudence, it remains far higher than LCOEs for owned solar resources and solar PPAs that could be available to replace the Project.

[14] Company witness Kelly Direct Testimony at 4.

IV. NEED FOR CVOW PROJECT

Q. WHAT ARE THE ISSUES TO BE CONSIDERED IN DECIDING WHETHER VEPCO NEEDS TO CONSTRUCT THE CVOW PROJECT?

A. The key issues to be considered in evaluating whether VEPCO needs the CVOW Project are whether the Project is required to meet the firm capacity and carbon reduction requirements of the Company's system when it is fully placed in service by 2027. This analysis of need is the first step in determining prudence of the CVOW Project. The second step of the CVOW prudence analysis is the evaluation of whether the Project represents the lowest reasonable cost alternative to supply the identified capacity and carbon reduction needs, as well as the consideration of the qualitative value of factors such as societal benefits which may be relevant to the analysis.

Q. WHAT INFORMATION HAS VEPCO PRESENTED TO DEMONSTRATE THAT THERE IS A NEED FOR THE CVOW PROJECT IN 2027?

A. VEPCO witness Kelly asserts that the CVOW Project is required to meet VEPCO's customer's capacity and energy needs and the VCEA's RPS carbon reduction requirements, and he provides three graphical figures to support these claims. [15]

Q. DO THE FIGURES PRESENTED ON PAGES 4 AND 6 OF MR. KELLY'S DIRECT TESTIMONY REASONABLY REFLECT VEPCO'S CAPACITY AND CARBON NEED FOR THE CVOW PROJECT?

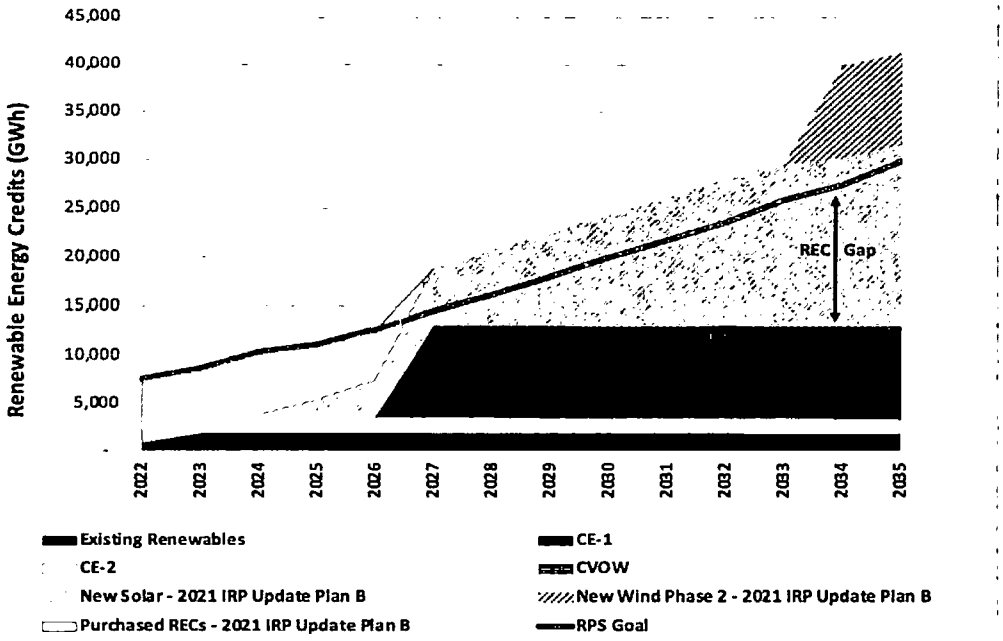
A. No. Each of these three figures include only VEPCO's existing and approved renewable resources plus the CVOW Project, but exclude VEPCO's planned renewable resource

[15] See Kelly Direct Testimony at 3-6 and Figures 1, 2 and 3.

additions between 2022 and 2035 that are identified in the Company's 2021 IRP and RPS plan.[16] This exclusion of other planned resources leads to the significant overstatement of VEPCO's carbon reduction and capacity requirements in 2027. For example, Revised Figure 1 below represents the Company's carbon reduction including CVOW and all other currently planned renewable resources for the period 2022 through 2035. As shown, when other planned resources are included along with the CVOW Project, VEPCO's carbon reduction is approximately 29% higher than the VCEA RPS goal required when the Project begins full commercial operations in 2027 and increases to 38% higher than the RPS goal by 2035.

[16] See Exhibit SN-4, VEPCO's responses to AG 2-8, AG 2-11 and AG 2-12.

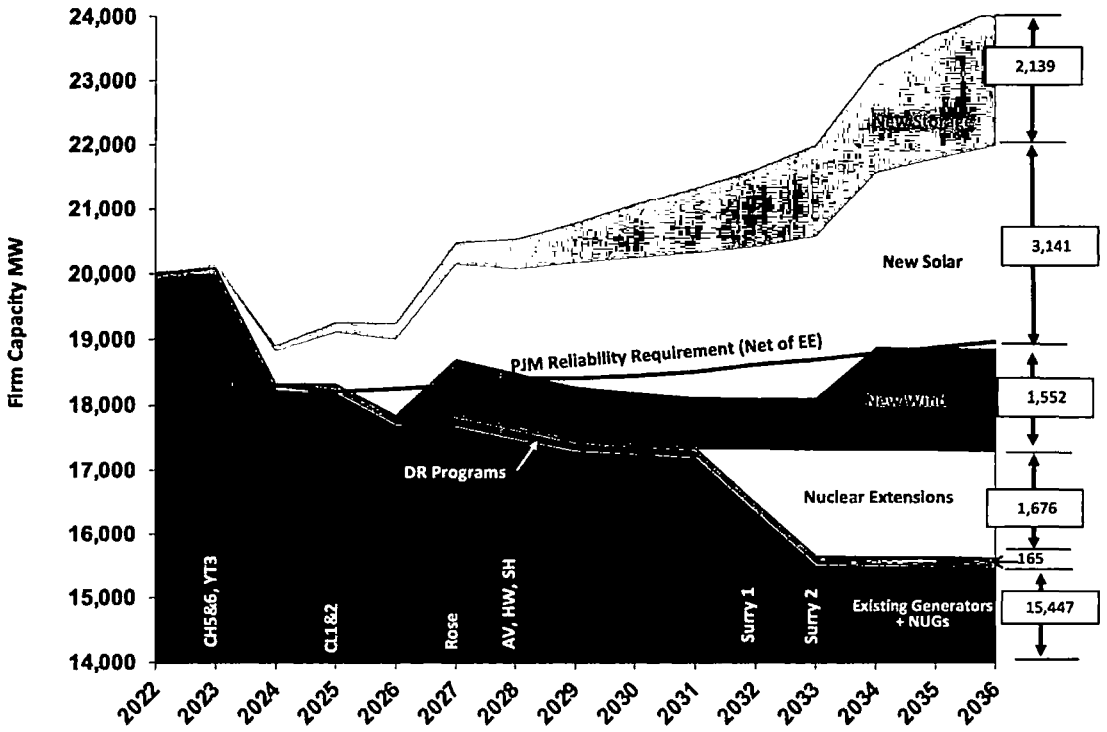
Revised Figure 1
VEPCO Carbon Reduction vs VCEA RPS Requirements with the CVOW Project and Other VEPCO Planned Renewable Resources[17]



Moreover, as shown in Revised Figure 2.1 below, when VEPCO's other planned renewable resources are included along with the CVOW Project, the Company's system firm capacity level grows from approximately 2,171 MW (12%) higher than VEPCO's PJM firm capacity requirement beginning in 2027 and grows to 4,673 MW (26%) higher than VEPCO's PJM capacity requirement by 2035. In fact, VEPCO forecasts that it will have excess capacity (i.e., capacity above its PJM requirement) even without the CVOW Project for the entire 2022-2035 period covered by Revised Figure 2.1.

[17] Source of Revised Figure 1 is VEPCO's response to AG 2-8.

Revised Figure 2.1
VEPCO System Capacity and PJM Capacity Requirement with the CVOW Project and Other VEPCO Planned Renewable Resources[18]



Q. WHAT DO THE ABOVE REVISED FIGURES 1 AND 2.1 INDICATE REGARDING THE NEED FOR THE CVOW PROJECT?

A. The revised Figures 1 and 2.1 indicate that when other planned resources identified in VEPCO's 2021 IRP and RPS Plan are properly considered, there is not a need for the CVOW Project's firm capacity or for a significant portion of the carbon reduction provided by the Project during the 2027-2035 period.

[18] Source of Revised Figure 2.1 is VEPCO's response to AG 2-11.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING THE NEED FOR VEPCO'S PROPOSED CVOW PROJECT.

A. The Company's forecast indicates that, including other resources planned to meet the VCEA's annual RPS Requirements, VEPCO expects to have excess capacity before and after the CVOW Project is to be placed in service and extending through at least 2035. VEPCO's forecast also indicates that the Company would need additional renewable resources or purchased RECs to meet VCEA RPS requirements but does not need the full level of carbon reduction supplied from the CVOW Project. Based on this information, I conclude that the Project is not required to serve VEPCO's forecasted system capacity requirements, but can be used, and may be needed, to supply a portion of the Company's VCEA RPS requirement from 2027 through at least 2035.

V. COST/BENEFIT ANALYSIS FOR CVOW PROJECT

Q. PLEASE DESCRIBE VEPCO'S CBA FOR THE CVOW PROJECT.

A. VEPCO's CBA for the CVOW Project used the PLEXOS[19] modeling software to estimate the costs and benefits of operating the CVOW Project for a Base Case that used PJM's load forecast and for a sensitivity case used the Company's load forecast, which is lower than PJM's forecast.[20] For both cases, costs and benefits of the Project were estimated by calculating the cumulative net present value ("NPV") of the difference

[19] The PLEXOS model is widely used within the utility industry and has been used by VEPCO to develop past integrated resource plans ("IRP") including the 2020 IRP and the 2021 IRP Update.

[20] See Kelly Direct Testimony at 15. It is my understanding that the Commission has previously ruled that the Company should use PJM's Load Forecast as the base case forecast for developing Integrated Resource Plans.

between forecasted production costs[21] of the VEPCO system for a scenario including the CVOW Project to costs of the system of a second scenario without the Project over the 34-year study period 2022 to 2056. In addition, in calculating the CVOW Project benefits, VEPCO adjusted the costs of the cases without the Project to include a forecasted $4.9 billion REC deficiency penalty that it assumes would occur in the scenario without CVOW.

Q. WHAT ARE THE ESTIMATED BASE CASE BENEFITS OF THE CVOW PROJECT EXCLUDING VEPCO'S ESTIMATE OF SOCIAL COST OF CARBON BENEFITS?

A. As summarized in Table 1 below, under VEPCO's Base Case analysis, the CVOW Project scenario is $746.3 million more costly than the scenario without CVOW on a cumulative NPV basis over the 34-year study period.

Q. WHY DID YOU REMOVE THE COMPANY'S ESTIMATE OF THE SOCIAL COST OF CARBON BENEFIT IN CALCULATING THE COSTS OF THE CVOW PROJECT AS PRESENTED IN TABLE 1?

A. As discussed later in my testimony, VEPCO's $3.2 billion SCoC benefit is not a direct benefit to the cost of service paid by electric customers and, in any event, it has been improperly calculated in the Company's CBA.

[21] The "production costs" evaluated in VEPCO's PLEXOS CBA include capital additions, fuel, purchased energy, emissions costs and operations and maintenance costs, net of capacity and energy sales revenues.

Table 1
Forecasted Cost/(Benefit) of CVOW Scenario vs No CVOW Scenario
2022-2056 Cumulative NPV, $1000s

	Case 1 No CVOW	Case 2 with CVOW	Case 2 - Case 1 CVOW Cost/(Benefit)
Fuel Cost	$14,925,217	$13,946,383	($978,834)
VO&M Cost	$1,582,335	$1,527,591	($54,743)
Emissions Cost	$1,567,052	$1,400,435	($166,617)
Fixed Costs	$28,317,210	$37,715,791	$9,398,582
Total Generation Cost	$46,391,813	$54,590,201	$8,198,388
Market Energy Purchases	$10,982,067	$8,841,983	($2,140,084)
Capacity Sale Revenue	($20,660,752)	($21,081,715)	($420,963)
Total System Cost	$36,713,128	$42,350,469	$5,637,341
REC Deficiency Penalty	$4,891,033	$0	($4,891,033)
		Total CVOW Cost/(Benefit)	$746,308
		% of Total System Cost	1.8%

Q. DO YOU HAVE ANY CONCERNS REGARDING VEPCO'S CBA FOR THE CVOW PROJECT?

A. Yes. The main flaw in VEPCO's CBA for the Project is that analysis calculates benefits of the CVOW Project by comparing total production costs of the system for a scenario with the Project ("CVOW Scenario") to production costs of the system under an "Alternate Scenario" that excludes the CVOW Project but assumes that the Company does not replace the CVOW capacity and energy with other renewable resources. The Company also admits that the modeling for the CVOW CBA was forced to select CVOW in the cases including the Project and also forced the models to select the nuclear license

renewal alternatives and to remove new solar resources as an option for all cases.[22] The resultant modeled resources for the Base Case analysis are summarized in Table 2:

Table 2
VEPCO CBA Resource Additions (2022-2056)[23]

	Base Case without CVOW				Base Case with CVOW			
Year	New Solar	New Wind	New Battery Storage	Nuclear License Extensions	New Solar	New Wind	New Battery Storage	Nuclear License Extensions
2022	15	-	-	-	15	-	-	-
2023	46	-	20	-	46	-	20	-
2024	857	-	83	-	857	-	83	-
2025	-	-	90	-	-	-	90	-
2026	-	-	120	-	-	-	120	-
2027	-	-	120	-	-	2,587	120	-
2028	-	-	150	-	-	-	150	-
2029	-	-	180	-	-	-	180	-
2030	-	-	300	-	-	-	300	-
2031	-	-	240	-	-	-	240	-
2032	-	-	240	838	-	-	240	838
2033	-	-	300	838	-	-	300	838
2034	-	-	300	-	-	-	300	-
2035	-	-	330	-	-	-	330	-
2036	-	-	240	-	-	-	240	-
2037	-	-	-	-	-	-	-	-
2038	-	-	-	838	-	-	-	838
2039	-	-	-	-	-	-	-	-
2040	-	-	-	835	-	-	-	835
2041	-	-	30	-	-	-	30	-
2042	-	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-	-
2044	-	-	30	-	-	-	30	-
2045	-	-	-	-	-	-	-	-
2046	-	-	-	-	-	-	-	-
2047	-	-	-	-	-	-	-	-
2048	-	-	-	-	-	-	-	-
2049	-	-	-	-	-	-	-	-
2050	-	-	-	-	-	-	-	-
2051	-	-	-	-	-	-	-	-
2052	-	-	-	-	-	-	-	-
2053	-	-	-	-	-	-	-	-
2054	-	-	-	-	-	-	-	-
2055	-	-	-	-	-	-	-	-
2056	-	-	-	-	-	-	-	-

These forced modeling parameters and the Company's use of a "Do Nothing" Alternate Scenario as the base for quantifying benefits of the CVOW Project are unjustified and unrealistic and create illusory benefits for the CVOW Project by forcing the Alternate Scenario to have less capacity and less renewable energy than the CVOW Scenario and

[22] See Exhibit SN-5, VEPCO's response to AG 2-17.

[23] See Exhibit SN-6, VEPCO's response to AG 2-22.

by forcing the model to select the CVOW Project and to ignore solar resources that could replace the Project and that have a much lower cost than the CVOW Project.[24]

Q. WHICH CVOW BENEFITS RESULT FROM VEPCO'S FORCING THE PLEXOS MODEL NOT TO SELECT ANY RENEWABLE ENERGY RESOURCES IN THE ALTERNATE NO CVOW CASE?

A. VEPCO's constraint on the PLEXOS model not to add any solar resources after 2024 in the Alternate Scenario of the CBA forces the CVOW Scenario to have approximately 862 MW per year of additional capacity and $281 million MWh of additional renewable energy than the Alternate Scenario without the CVOW Project for each year of the forecasted 30-year service life of the CVOW Project. This difference in renewable resources which VEPCO improperly forced into its PLEXOS modeling improperly imputes "benefits" for the CVOW Project in the form of higher capacity sale revenues, lower fuel costs, lower emission costs and higher REC deficiency penalty avoidance benefits.

Q. HOW WOULD VEPCO'S CBA RESULTS CHANGE IF THE IMPROPERLY IMPUTED BENEFITS RESULTING FROM VEPCO'S MODELING OF THE ALTERNATE WITHOUT CVOW CASE ARE REMOVED?

A. As summarized in Table 3 below, adjusting VEPCO's CBA results to remove the false fuel, purchased energy, emissions, capacity and REC penalty avoidance benefits increases the cost advantage of the No CVOW case to more than $9.3 billion, excluding the Company's proposed $3.2 billion SCoC benefit.

[2424] See Exhibit SN-6.

Table 3
Adjusted Cost/(Benefit) of CVOW Scenario vs No CVOW Scenario
2022-2056 Cumulative NPV, $1000s

	Case 1 No CVOW	Case 2 with CVOW	Adjusted CVOW Cost/(Benefit)
Fuel Cost	$14,925,217	$13,946,383	$0
VO&M Cost	$1,582,335	$1,527,591	($54,743)
Emissions Cost	$1,567,052	$1,400,435	$0
Fixed Costs	$28,317,210	$37,715,791	$9,398,582
Total Generation Cost	$46,391,813	$54,590,201	$9,343,838
Market Energy Purchases	$10,982,067	$8,841,983	$0
Net Generation Cost	$57,373,880	$63,432,184	$9,343,838
Capacity Sale Revenue	($20,660,752)	($21,081,715)	$0
Total System Cost	$36,713,128	$42,350,469	$9,343,838
REC Deficiency Penalty	$4,891,033	$0	$0
		Total CVOW Cost/(Benefit)	$9,343,838
		% of Total System Cost	22.1%

Q. DO YOU HAVE OTHER CONCERNS REGARDING VEPCO'S CBA FOR THE CVOW PROJECT?

A. Yes. I am concerned that VEPCO's CBA analysis for the CVOW Project does not include sensitivity analyses to assess the impact of uncertainty in forecasted commodity prices, carbon emissions prices or PJM market energy prices, all of which could have a major impact on benefits of the CVOW Project. For example, the commodities price forecasts used for all CBA scenarios assumes that Virginia remains as a member of the Regional Greenhouse Gas Initiative ("RGGI") and that federal CO_2 legislation becomes effective in 2026. VEPCO's carbon price forecasts are uncertain considering the fact that

there currently are no federal charges for carbon emissions and it is my understanding that Virginia's new governor has indicated that he does not believe Virginia's membership in RGGI is beneficial to Virginia consumers. In my experience, it is unusual for studies of major utility investments such as the $9.8 billion CVOW Project to be conducted without sensitivity analyses for commodity prices and carbon price forecasts.

Another concern I have with VEPCO's CBA for the CVOW Project is that the analysis includes approximately $420 Million of benefit for higher forecasted capacity sales revenues for the CVOW Scenario. As discussed earlier, this forecasted capacity revenue benefit is influenced by VEPCO's decision to force the Alternate Plan to not add replacement capacity for the CVOW Project. But the forecasted capacity benefit also assumes that the Company would be able to sell all firm excess capacity reflected in the CVOW Scenario. This assumption is unduly speculative and optimistic considering the uncertainty regarding future market capacity prices and the restrictions that will apply to VEPCO's sale of capacity in the PJM market if it remains a Fixed Resource Requirement ("FRR") utility in PJM. VEPCO did not conduct sensitivity analyses to assess either of these risks that the forecasted capacity revenue benefits of the CVOW Scenario would not be realized. This creates significant risk that VEPCO's customers will have to pay for the $9.8 billion fixed costs of the CVOW Project without realizing any of the forecasted capacity revenue benefits of the Project, which are not guaranteed.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING VEPCO'S CBA FOR THE CVOW PROJECT.

A. VEPCO's CBA for the CVOW Project has flaws that serve to create assumed benefits that are overstated, uncertain, and largely driven by forcing the No CVOW Scenario to

have lower capacity and renewable energy levels than the CVOW Scenario. These flaws serve to improperly impute $8.6 billion capacity, fuel, emissions cost, purchased energy and REC penalty avoidance benefits for the CVOW Project that result from the Company's decision to force the PLEXOS model to add no new renewable resources to the Alternate (No CVOW) Scenario after 2024. If the benefits from this unrealistic constraint were removed, the Base Case Scenario with the CVOW Project would be approximately $9.3 billion more costly on a cumulative NPV basis than the Alternate Scenario without the CVOW Project.

Moreover, the Company has not presented a least cost plan in this case as was required by the Commission's Order in Case No. PUR-2020-00134, nor has it demonstrated that the CVOW Scenario or the Alternate Scenario are the best available alternatives for customers as required by the Commission's Rate Case Rules. The PLEXOS model was forced in both scenarios to select certain resources, which in turn limited the volume of solar resources selected, which calls into question whether the forecasted cost differences between the CVOW and Alternative Scenarios really represent CVOW Project benefits as VEPCO's CBA assumes. For these reasons, I am unable to conclude whether the proposed CVOW Project is likely to benefit customers or whether the Project is the best available alternative for supplying the Company's system capacity, energy and carbon reduction requirements from the information presented by VEPCO in this case.

VI. SOCIAL COST OF CARBON

Q. WHAT IS THE SOCIAL COST OF CARBON?

A. The SCoC represents the estimated indirect cost to society of carbon emissions, typically measured on a dollars per metric tons basis.[25]

Q. WHY IS THE SOCIAL COST OF CARBON AN ISSUE IN THIS PROCEEDING?

A. VEPCO has estimated the cumulative NPV SCoC benefit of the Company's CVOW Project to be $3.22 billion over the 34-year study period addressed by the CBA and has included this SCoC benefit estimate as a direct cost savings to electric customers in calculating the net benefits of the Project. [26] It is my understanding that the Company's inclusion of the estimated SCoC benefit in the CBA for the Project is based on § 56-585.1 A 6, as amended by the VCEA, which provides that:

> In any application to construct a new generating facility, the utility shall include, and the Commission shall consider, the social cost of carbon, as determined by the Commission, as a benefit or cost, whichever is appropriate. . . . The Commission may adopt any rules it deems necessary to determine the social cost of carbon and shall use the best available science and technology, including the Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, published by the Interagency Working Group on Social Cost of Greenhouse Gases from the United States Government in August 2016, as guidance. The Commission shall include a system to adjust the costs established in this section with inflation.

[25] See the Direct Testimony of VEPCO witness Kelly, page 13.

[26] See the Direct Testimony of VEPCO witness Kelly, page 14.

Q. IS VEPCO'S PROPOSAL TO TREAT THE ESTIMATED SCOC BENEFIT AS A DIRECT COST SAVINGS TO CUSTOMERS REASONABLE?

A. No. VEPCO's estimated SCoC is improperly calculated and overstates the net benefit of the Project by assuming there is no societal benefit associated with renewable resources that the Company would acquire to replace the CVOW Project if the Project is not constructed. The overstatement in VEPCO's SCoC is directly caused by the Company's decision to force the CVOW Project Scenario to have a greater level of capacity and renewable energy than the Alternate Scenario without the CVOW project.

Q. HOW SHOULD THE COMMISSION CONSIDER VEPCO'S SCOC BENEFIT ESTIMATE IN EVALUATING THE BENEFITS OF THE CVOW PROJECT TO VEPCO'S CUSTOMERS?

A. At the outset, it should be noted that the estimated SCoC benefit, whatever that figure is determined to be, has no direct impact on VEPCO's cost of service or charges to electric customers. The Company acknowledges that the estimated SCoC benefit could be supplied by other lower cost renewable resources and has no impact on VEPCO's electric cost of service or charges to its customers.[27] It has been my experience that societal benefits such as the SCoC are in some instances considered as a secondary qualitative factor when evaluating major electric investments such as the CVOW Project. However, VEPCO's SCoC benefit estimate in this case is the product of improper modeling assumptions and therefore should be given little or no weight.

[27] See Exhibit SN-7, VEPCO's response to AG 3-51 and AG 3-52.

Q. ARE THERE OTHER REASONS WHY THE COMMISSION SHOULD NOT CONSIDER VEPCO'S ASSUMED SOCIAL COST OF CARBON AS A DIRECT SAVINGS TO VEPCO'S CUSTOMERS?

A. Yes. VEPCO's SCoC benefit estimate is based on the forecasted energy production of the CVOW Project and the federal interagency working group's interim SCoC estimates, which were published in February of 2021. These charges are subject to changes when federal energy policies change over time. For example, a recent Washington Post article notes that the Biden Administration's interim SCoC estimate ($51/metric ton in 2021) is approximately 50 times higher than the prior administration's SCoC rate of $1/metric ton.[28] Obviously, the SCoC estimates are uncertain and future changes in those estimates could change the $3.2 billion SCoC benefit forecast which VEPCO proposes to use for evaluating potential benefits of the CVOW project to customers.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATION REGARDING VEPCO'S PROPOSED SCOC BENEFIT ADJUSTMENT FOR THE CVOW PROJECT.

A. VEPCO's $3.2 billion SCoC benefit estimate for the Project is improperly calculated, overstated and uncertain, and has no direct impact on VEPCO's cost of service or charges to electric customers. For these reasons, VEPCO's $3.2 billion SCoC benefit estimate for the CVOW project should be considered only as a secondary qualitative factor in evaluating the CVOW Project and should not be treated as a direct customer benefit of the Project as VEPCO proposes.

[28] See Exhibit SN-8.

VII. CONCLUSIONS AND RECOMMENDATIONS

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS.

A. Apart from the legislative policy preferences expressed in the 2020 VCEA, based on my analysis: (1) the $9.8 billion CVOW Project is not needed to serve the Company's system capacity requirement through at least 2035, (2) the capital costs are approximately 2 to 3 times the cost of solar resources, and (3) VEPCO's forecasted economic benefits of the Project are based on a CBA that overstates the benefits, which remain within the margin of error for a 34-year forecast of utility system costs. Moreover, VEPCO's CBA does not include sensitivity analysis necessary to evaluate the impact of uncertainty in forecasted commodity prices, carbon costs, or the cost or performance of the CVOW Project.

Notwithstanding my reservations regarding the need for and cost of the CVOW Project, I understand that the Virginia General Assembly has declared that utility-owned offshore wind electric generation facilities are to be in the public interest, and the law directs the Commission to give due consideration to economic development and SCoC benefits of the Project.

To this end, and in consideration of the high fixed cost and uncertain benefits of the CVOW Project, if approved, I recommend that VEPCO be required to file periodic status reports, similar to the requirement for the Virginia City Hybrid Energy Center, that address the performance and cost of the Project through the construction period and for at least the first year of commercial operations. I further recommend that the Commission cap the cost of the CVOW Commercial Project and related interconnection facilities at the Company's $9.8 billion estimated cost level presented in this case (which already

includes hedging and contingencies), and that the capital investment, O&M costs and operating performance of the CVOW facility be subject to minimum standards that reasonably reflect the assumed costs and performance level (42% capacity factor) reflected in the Company's CBA for the Project, as measured on a rolling 3-year average basis. Additionally, the Commission should have the Company publicly commit to in-service dates for the CVOW Project. In the event that the Company has reasonable belief that an in-service date is going to be delayed by more than 6 months or that the $9.8 billion estimated cost of the Project will be exceeded by 5% or more, the Commission should require that the Company make an immediate filing with the Commission that provides notice of the delay or cost increase, provides an explanation of the reasons for the delay or cost increase, and which reopens the question of prudence in light of the delay in scheduled in-service dates or Project cost overruns. My experience is that a delay to an expected in-service date for large generation projects such as the CVOW Project can lead to with significant project cost overruns and replacement power costs.

While these controls may not guarantee that ratepayers receive the benefits of the CVOW Project assumed by the Company as support for the Project in this case, I believe they are reasonable and appropriate in light of the significant risk faced by customers by this project.

Q. DOES THAT CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes. However, I reserve the right to present oral surrebuttal testimony at the hearing to respond to any new issues that may be raised by VEPCO in its rebuttal testimony.

EX. SN-1

DON SCOTT NORWOOD

Norwood Energy Consulting, L.L.C.

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

SUMMARY

Scott Norwood is an energy consultant with over 39 years of utility industry experience in the areas of regulatory consulting, resource planning, power plant operations and energy procurement. His clients include government agencies, publicly-owned utilities, public service commissions, municipalities and various electric consumer interests. Over the last 15 years Mr. Norwood has presented expert testimony on electric utility ratemaking, resource planning, and electric utility restructuring issues in over 200 regulatory proceedings in Arkansas, Georgia, Iowa, Illinois, Michigan, Missouri, New Jersey, Oklahoma, South Dakota, Texas, Virginia, Washington and Wisconsin.

Prior to founding Norwood Energy Consulting in January of 2004, Mr. Norwood was employed for 18 years by GDS Associates, Inc., a Marietta, Georgia based energy consulting firm. Mr. Norwood was a Principal of GDS and directed the firm's Deregulated Services Department which provided a range of consulting services including merchant plant due diligence studies, deregulated market price forecasts, power supply planning and procurement projects, electric restructuring policy analyses, and studies of power plant dispatch and production costs.

Before joining GDS, Mr. Norwood was employed by the Public Utility Commission of Texas as Manager of Power Plant Engineering from 1984 through 1986. He began his career in 1980 as Staff Electrical Engineer with the City of Austin's Electric Utility Department where he was in charge of electrical maintenance and design projects at three gas-fired power plants.

Mr. Norwood is a graduate of the college of electrical engineering of the University of Texas.

EXPERIENCE

The following summaries are representative of the range of projects conducted by Mr. Norwood over his 30-year consulting career.

Regulatory Consulting

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

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of a $1.7 billion coal-fired power plant and related settlement agreements with Sierra Club.

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

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

Virginia Attorney General – Analyzed and presented testimony regarding distribution tap line undergrounding program proposed by Dominion Virginia Power Company.

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of the utility's decision to retire the Welsh Unit 2 coal-fired generating unit in conjunction with a litigation settlement agreement with Sierra Club.

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

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

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

City of Houston - Analyzed and presented comments on various legislative proposals impacting retail electric and gas utility operations and rates in Texas.

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

Virginia Attorney General – Analyzed and presented testimony regarding an accelerated vegetation management program and rider proposed by Appalachian Power Company.

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

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

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

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

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

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

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

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

Energy Planning and Procurement Services

Virginia Attorney General – Review and provide comments or testimony regarding annual integrated resource plan filings made by Dominion Virginia Power and Appalachian Power Company.

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

Texas Association of School Boards Electric Aggregation Program – Serve as TASB's

consultant in the development, marketing and administration of a retail electric aggregation program consisting of 2,500 Texas schools with a total load of over 300 MW. Program produced annual savings of more than $30 million in its first year.

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

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

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

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

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

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

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

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

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

Austin Energy - Provided technical assistance in the evaluation of the economic viability of the

City of Austin's ownership interest in the South Texas Project.

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

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

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

Virginia Attorney General – Review and provide comments or testimony regarding annual demand-side management program programs and rider proposals made by Dominion Virginia Power and Appalachian Power Company.

Austin Energy – Conducted modeling to assess potential costs and benefits of a municipal power pool in Texas.

Electric Restructuring Analyses

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

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

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

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

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

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

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

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

separation plans, and competitive metering.

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

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

Cullen Weston Pines & Bach/Citizens' Utility Board - Evaluated estimated costs and benefits of the proposed merger of Wisconsin Energy Corporation and Northern States Power Company (Primergy).

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

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

Power Plant Management

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

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

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

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

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

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

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

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

PRESENTATIONS

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

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

EX. SN-2

Extraordinarily Sensitive Information Redacted
Rate Outlook 2020 to 2035

RESIDENTIAL BILL PROJECTION - PLAN B, DIRECTED METHODOLOGY

Rate projections are not final. Rates are subject to regulatory approval.
Certain line items potentially eligible for customer credit reinvestment offset under Va. Code.
Rate projections assume return on equity of 9.20%.

RESIDENTIAL Schedule 1 (1,000 kWh)	2019 DEC 2019	2020 MAY 1, 2020	2020 DEC 2020	2021 DEC 2021	2022 DEC 2022	2023 DEC 2023	2024 DEC 2024	2025 DEC 2025	2026 DEC 2026	2027 DEC 2027	2028 DEC 2028	2029 DEC 2029	2030 DEC 2030	2031 DEC 2031	2032 DEC 2032	2033 DEC 2033	2034 DEC 2034	2035 DEC 2035
DISTRIBUTION & GENERATION (BASE) [1]	$ 61.82	$ 61.82	$ 61.82	$ 61.82	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54	$ 61.54
TRANSMISSION - RIDER T	$ 19.72	$ 19.72	$ 20.29	$ 16.60														
FUEL (MARKET FORECAST)	$ 23.25	$ 17.36	$ 17.02	$ 20.45														
DSM (APPROVED & PROPOSED)	$ 1.13	$ 1.13	$ 6.49	$ 1.37														
RIDER PIPP - UNIVERSAL SERVICE FEE [2]	$ -	$ -	$ -	$ 0.03														
Generation Infrastructure																		
EXISTING GENERATION RIDERS [3]	$ 12.91	$ 12.76	$ 12.87	$ 13.39														
RIDER SNA - NUCLEAR SUBSEQUENT LICENSE RENEWAL	$ -	$ -	$ -	$ -														
Distribution Infrastructure																		
GT PLAN (APPROVED PHASE 1)	$ -	$ -	$ -	$ -														
STRATEGIC UNDERGROUND PLAN	$ 1.84	$ 1.40	$ 1.40	$ 2.14														
RURAL BROADBAND	$ -	$ -	$ -	$ 0.03														
AS Environmental																		
RIDER E	$ 1.99	$ 1.99	$ 7.48	$ 1.25														
RIDER RGGI	$ -	$ -	$ -	$ 2.39														
RIDER CCR	$ -	$ -	$ -	$ 2.95														
Additional Resources in Plan B																		
INCREMENTAL GENERIC DSM	$ -	$ -	$ -	$ -														
INCREMENTAL GT PLAN (PHASE 2 + FUTURE PHASES)	$ -	$ -	$ -	$ -														
VCHEC 2045 RETIREMENT	$ -	$ -	$ -	$ -	$ 0.08	$ 0.26	$ 0.24	$ 0.23	$ 0.24	$ 0.22	$ 0.22	$ 0.21	$ 0.20	$ 0.19	$ 0.18	$ 0.17	$ 0.16	$ 0.14
RPS Program-Related Resources Plan B																		
RIDER RPS [4]	$ -	$ -	$ -	$ 0.18	$ 0.49	$ 1.24	$ 1.41	$ 1.96	$ 1.97	$ 1.38	$ 1.41	$ 1.36	$ 1.20	$ 0.81	$ 0.93	$ 1.13	$ 0.76	$ 0.99
RIDER CE [5]	$ -	$ -	$ -	$ 0.19	$ 2.19	$ 3.80	$ 5.69	$ 8.62	$ 10.81	$ 13.25	$ 15.86	$ 18.36	$ 20.77	$ 23.37	$ 25.94	$ 28.50	$ 30.83	$ 32.54
RIDER CE - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ (0.07)	$ (0.17)	$ (0.70)	$ (1.21)	$ (1.72)	$ (2.22)	$ (2.82)	$ (3.42)	$ (3.97)	$ (4.59)	$ (5.35)	$ (6.07)	$ (6.79)	$ (7.46)
RIDER CE - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.30)	$ (0.86)	$ (0.75)	$ (0.66)	$ (0.57)	$ (0.44)	$ (0.52)	$ (0.61)	$ (0.72)	$ (0.81)
RIDER CE - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ (0.02)	$ (0.08)	$ (0.30)	$ (0.55)	$ (0.84)	$ (1.15)	$ (1.49)	$ (1.85)	$ (2.26)	$ (2.69)	$ (3.17)	$ (3.66)	$ (4.19)	$ (4.74)
TOTAL RIDER CE	$ -	$ -	$ -	$ 0.19	$ 2.09	$ 3.55	$ 4.70	$ 6.86	$ 7.96	$ 9.03	$ 10.81	$ 12.43	$ 13.98	$ 15.64	$ 16.91	$ 18.17	$ 19.13	$ 19.52
RIDER PPA [6]	$ -	$ -	$ -	$ -	$ 0.32	$ 0.46	$ 0.84	$ 1.21	$ 1.77	$ 2.26	$ 2.79	$ 3.39	$ 3.84	$ 4.49	$ 5.22	$ 5.92	$ 6.48	$ 7.23
RIDER PPA - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.64)	$ (0.73)	$ (1.01)	$ (1.27)	$ (1.59)	$ (1.91)	$ (2.20)	$ (2.55)	$ (2.96)	$ (3.34)	$ (3.72)	$ (4.08)
RIDER PPA - REC PROXY	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.42)	$ (0.50)	$ (0.42)	$ (0.38)	$ (0.32)	$ (0.24)	$ (0.28)	$ (0.33)	$ (0.38)	$ (0.42)
RIDER PPA - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.12)	$ (0.19)	$ (0.34)	$ (0.51)	$ (0.69)	$ (0.88)	$ (1.09)	$ (1.32)	$ (1.57)	$ (1.83)	$ (2.10)	$ (2.39)
TOTAL RIDER PPA	$ -	$ -	$ -	$ -	$ 0.32	$ 0.46	$ 0.08	$ 0.30	$ 0.00	$ (0.03)	$ 0.09	$ 0.23	$ 0.24	$ 0.38	$ 0.42	$ 0.43	$ 0.27	$ 0.34
RIDER OSW [7]	$ -	$ -	$ -	$ -	$ 2.23	$ 2.79	$ 6.34	$ 10.01	$ 12.06	$ 19.16	$ 18.24	$ 20.19	$ 19.89	$ 23.02	$ 26.65	$ 28.02	$ 35.44	$ 33.59
RIDER OSW - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.44)	$ (3.45)	$ (3.56)	$ (3.63)	$ (3.71)	$ (3.82)	$ (3.98)	$ (4.61)	$ (8.46)	$ (8.69)
RIDER OSW - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.08)	$ (0.98)	$ (0.83)	$ (0.57)	$ (0.51)	$ (0.53)	$ (0.57)	$ (0.65)	$ (1.15)
RIDER OSW - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.55)	$ (0.56)	$ (0.58)	$ (0.60)	$ (0.62)	$ (0.63)	$ (0.65)	$ (1.34)	$ (1.38)
TOTAL OFFSHORE WIND (2 PHASES TOTALING 5,154 MW) [8]	$ -	$ -	$ -	$ -	$ 2.23	$ 2.79	$ 6.34	$ 10.01	$ 11.62	$ 15.08	$ 13.14	$ 15.15	$ 15.01	$ 18.08	$ 21.51	$ 22.20	$ 25.00	$ 22.37
RPS PROGRAM-RELATED RESOURCES SUBTOTAL	$ -	$ -	$ -	$ 0.37	$ 5.12	$ 8.04	$ 12.52	$ 19.13	$ 21.55	$ 25.47	$ 25.44	$ 29.17	$ 30.42	$ 34.91	$ 39.77	$ 41.92	$ 45.16	$ 43.22
PLAN B TOTAL	$ 122.66	$ 116.18	$ 127.38	$ 122.77	$ 130.78	$ 135.78	$ 145.42	$ 152.09	$ 163.05	$ 168.18	$ 170.93	$ 174.85	$ 177.29	$ 183.84	$ 189.36	$ 194.18	$ 199.51	$ 197.57
CAGR PLAN B (2019 BASE)													3.4%					3.0%
CAGR PLAN B (MAY 2020 BASE)													4.0%					3.4%

[1] Publicly available, annualized tariff rates consistent with filing in Case No. PUR-2021-00058. No future change modeled.
[2] No assumptions modeled for exemptions to Riders OSW & PIPP.
[3] Riders B, R, S, W, BW, GV, US-2, US-3 and US-4.
[4] Includes the cost of purchases plus the cost of the REC proxy value from Company-owned facilities.
[5] Includes CE-1 and CE-2 projects, generic solar, distributed solar, and storage.
[6] Includes CE-2 PPAs, generic solar and storage.
[7] Assumes the build-out of two phases totaling 5,154 MW. Additional details specific to the Phase I CVOW project will be included in a Q4 2021 filing.

2021 RPS Development Plan
Attachment 10: Consolidated Bill Analysis

Extraordinarily Sensitive Information Redacted
Rate Outlook 2020 to 2035

SMALL GENERAL SERVICES BILL PROJECTION - PLAN B, DIRECTED METHODOLOGY

Rate projections are not final. Rates are subject to regulatory approval.
Certain line items potentially eligible for customer credit reinvestment offset under Va. Code.
Rate projections assume return on equity of 9.20%.

SMALL GENERAL SERVICE Schedule GS-1 (8,000 kWh - 15 kW)	2019 DEC 2019	2020 MAY 1, 2020	2020 DEC 2020	2021 DEC 2021	2022 DEC 2022	2023 DEC 2023	2024 DEC 2024	2025 DEC 2025	2026 DEC 2026	2027 DEC 2027	2028 DEC 2028	2029 DEC 2029	2030 DEC 2030	2031 DEC 2031	2032 DEC 2032	2033 DEC 2033	2034 DEC 2034	2035 DEC 2035
DISTRIBUTION & GENERATION (BASE) [4]	$ 276.54	$ 276.54	$ 276.54	$ 276.54	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65	$ 272.65
TRANSMISSION - RIDER T	$ 76.59	$ 76.59	$ 89.37	$ 70.55														
FUEL (MARKET FORECAST)	$ 139.52	$ 104.14	$ 102.13	$ 122.69														
DSM (APPROVED & PROPOSED)	$ 5.33	$ 5.33	$ 6.49	$ 6.59														
RIDER PIPP - UNIVERSAL SERVICE FEE [3]	$ -	$ -	$ -	$ 0.16														
Generation Infrastructure																		
EXISTING GENERATION RIDERS [3]	$ 61.54	$ 58.22	$ 57.99	$ 65.89														
RIDER SNA - NUCLEAR SUBSEQUENT LICENSE RENEWAL	$ -	$ -	$ -	$ -														
Distribution Infrastructure																		
GT PLAN (APPROVED PHASE 1)	$ -	$ -	$ -	$ -														
STRATEGIC UNDERGROUND PLAN	$ 8.75	$ 5.90	$ 5.90	$ 9.18														
RURAL BROADBAND	$ -	$ -	$ -	$ 0.12														
AS Environmental																		
RIDER E	$ 9.44	$ 9.44	$ 7.48	$ 5.99														
RIDER RGGI	$ -	$ -	$ -	$ 14.36														
RIDER CCR	$ -	$ -	$ -	$ 17.67														
Additional Resources in Plan B																		
INCREMENTAL GENERIC DSM	$ -	$ -	$ -	$ -														
INCREMENTAL GT PLAN (PHASE 2 + FUTURE PHASES)	$ -	$ -	$ -	$ -														
VCHEC 2045 RETIREMENT	$ -	$ -	$ -	$ -	$ 0.82	$ 1.01	$ 0.97	$ 0.95	$ 0.95	$ 0.89	$ 0.88	$ 0.83	$ 0.80	$ 0.77	$ 0.72	$ 0.67	$ 0.64	$ 0.58
RPS Program-Related Resources Plan B																		
RIDER RPS [4]	$ -	$ -	$ -	$ 1.09	$ 2.92	$ 7.41	$ 8.44	$ 11.77	$ 11.83	$ 8.28	$ 8.47	$ 8.16	$ 7.19	$ 4.83	$ 5.60	$ 6.78	$ 4.55	$ 5.93
RIDER CE [5]	$ -	$ -	$ -	$ 0.92	$ 8.95	$ 15.59	$ 23.35	$ 35.35	$ 44.35	$ 54.37	$ 65.06	$ 75.31	$ 85.21	$ 95.84	$ 106.43	$ 116.80	$ 126.45	$ 133.49
RIDER CE - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ (0.44)	$ (1.00)	$ (4.19)	$ (7.24)	$ (10.32)	$ (13.30)	$ (16.89)	$ (20.51)	$ (23.82)	$ (27.54)	$ (32.10)	$ (36.44)	$ (40.73)	$ (44.76)
RIDER CE - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (1.78)	$ (5.17)	$ (4.52)	$ (3.94)	$ (3.44)	$ (2.64)	$ (3.11)	$ (3.53)	$ (4.30)	$ (4.88)
RIDER CE - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ (0.09)	$ (0.33)	$ (1.22)	$ (2.27)	$ (3.46)	$ (4.71)	$ (6.10)	$ (7.61)	$ (9.26)	$ (11.06)	$ (12.98)	$ (15.00)	$ (17.19)	$ (19.46)
TOTAL RIDER CE	$ -	$ -	$ -	$ 0.92	$ 8.42	$ 14.26	$ 17.95	$ 25.85	$ 28.80	$ 31.19	$ 37.55	$ 43.25	$ 48.70	$ 54.61	$ 58.24	$ 61.84	$ 64.24	$ 64.39
RIDER PPA [6]	$ -	$ -	$ -	$ -	$ 1.60	$ 2.31	$ 4.15	$ 5.98	$ 8.65	$ 11.04	$ 13.58	$ 16.49	$ 18.67	$ 21.77	$ 25.24	$ 28.54	$ 31.09	$ 34.55
RIDER PPA - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ (3.82)	$ (4.36)	$ (6.04)	$ (7.64)	$ (9.55)	$ (11.43)	$ (13.17)	$ (15.30)	$ (17.73)	$ (20.04)	$ (22.33)	$ (24.49)
RIDER PPA - REC PROXY	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (2.49)	$ (3.02)	$ (2.53)	$ (2.25)	$ (1.90)	$ (1.43)	$ (1.69)	$ (1.96)	$ (2.30)	$ (2.49)
RIDER PPA - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.50)	$ (0.78)	$ (1.41)	$ (2.09)	$ (2.83)	$ (3.61)	$ (4.46)	$ (5.42)	$ (6.43)	$ (7.49)	$ (8.63)	$ (9.82)
TOTAL RIDER PPA	$ -	$ -	$ -	$ -	$ 1.60	$ 2.31	$ (0.17)	$ 0.84	$ (1.30)	$ (1.72)	$ (1.32)	$ (0.80)	$ (0.88)	$ (0.38)	$ (0.61)	$ (0.85)	$ (2.17)	$ (2.25)
RIDER OSW [7]	$ -	$ -	$ -	$ -	$ 9.13	$ 11.45	$ 25.99	$ 41.05	$ 49.46	$ 78.61	$ 74.81	$ 82.80	$ 81.56	$ 94.42	$ 109.31	$ 114.94	$ 145.38	$ 137.78
RIDER OSW - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (2.63)	$ (20.71)	$ (21.36)	$ (21.80)	$ (22.24)	$ (22.94)	$ (23.85)	$ (27.64)	$ (50.74)	$ (52.14)
RIDER OSW - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0.50)	$ (5.86)	$ (4.05)	$ (3.42)	$ (3.04)	$ (3.18)	$ (3.40)	$ (3.02)	$ (6.92)
RIDER OSW - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (2.24)	$ (2.31)	$ (2.38)	$ (2.45)	$ (2.52)	$ (2.59)	$ (2.67)	$ (5.48)	$ (5.64)
TOTAL OFFSHORE WIND (2 PHASES TOTALING 5,154 MW) [7]	$ -	$ -	$ -	$ -	$ 9.13	$ 11.45	$ 25.99	$ 41.05	$ 46.83	$ 55.16	$ 45.28	$ 53.67	$ 53.45	$ 65.92	$ 79.67	$ 81.23	$ 85.24	$ 73.08
RPS PROGRAM-RELATED RESOURCES SUBTOTAL	$ -	$ -	$ -	$ 2.01	$ 22.06	$ 35.43	$ 52.21	$ 79.51	$ 86.17	$ 92.91	$ 89.98	$ 104.28	$ 103.48	$ 124.97	$ 142.91	$ 148.89	$ 151.86	$ 141.16
PLAN B TOTAL	$ 577.71	$ 536.16	$ 545.89	$ 591.75	$ 607.63	$ 635.60	$ 677.38	$ 705.08	$ 750.20	$ 765.16	$ 778.22	$ 789.01	$ 798.41	$ 828.09	$ 847.99	$ 869.43	$ 885.02	$ 874.70
CAGR PLAN B (2019 BASE)													3.01%					2.61%
CAGR PLAN B (MAY 2020 BASE)													3.8%					3.2%

[1] Publicly available, annualized tariff rates consistent with filing in Case No. PUR-2021-00058. No future change modeled.
[3] *No assumptions modeled for exemptions to Riders OSW & PIPP.*
[3] Riders B, R, S, W, BW, GV, US-2, US-3 and US-4.
[4] Includes the cost of purchases plus the cost of the REC proxy value from Company-owned facilities.
[5] Includes CE-1 and CE-2 projects, generic solar, distributed solar, and storage.
[6] Includes CE-2 PPAs, generic solar and storage.
[7] Assumes the build-out of two phases totaling 5,154 MW. Additional details specific to the Phase I CVOW project will be included in a Q4 2021 filing.

Extraordinarily Sensitive Information Redacted
Rate Outlook 2020 to 2035

LARGE GENERAL SERVICES BILL PROJECTION - PLAN B, DIRECTED METHODOLOGY

Rate projections are not final. Rates are subject to regulatory approval.
Certain line items potentially eligible for customer credit reinvestment offset under Va. Code.
Rate projections assume return on equity of 9.20%.

LARGE GENERAL SERVICE Schedule GS-4 (6,000,000 kWh - 10,000 kW)	2019 DEC 2019	2020 MAY 1, 2020	2020 DEC 2020	2021 DEC 2021	2022 DEC 2022	2023 DEC 2023	2024 DEC 2024	2025 DEC 2025	2026 DEC 2026	2027 DEC 2027	2028 DEC 2028	2029 DEC 2029	2030 DEC 2030	2031 DEC 2031	2032 DEC 2032	2033 DEC 2033	2034 DEC 2034	2035 DEC 2035
DISTRIBUTION & GENERATION (BASE) [1]	$ 131,196.69	$ 131,196.69	$ 131,196.69	$ 131,196.69	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15	$ 119,032.15
TRANSMISSION - RIDER T	$ 37,760.00	$ 37,760.00	$ 42,270.00	$ 45,261.35														
FUEL (MARKET FORECAST)	$ 139,524.00	$ 104,142.00	$ 102,126.00	$ 122,688.00														
DSM (APPROVED & PROPOSED)	$ 150.00	$ 150.00	$ 6.49	$ 54.00														
RIDER PIPP - UNIVERSAL SERVICE FEE [2]	$ -	$ -	$ -	$ 162.00														
Generation Infrastructure																		
EXISTING GENERATION RIDERS [3]	$ 36,670.00	$ 34,070.00	$ 33,750.00	$ 34,570.00														
RIDER SNA - NUCLEAR SUBSEQUENT LICENSE RENEWAL	$ -	$ -	$ -	$ -														
Distribution Infrastructure																		
GT PLAN (APPROVED PHASE 1)	$ -	$ -	$ -	$ -														
STRATEGIC UNDERGROUND PLAN	$ -	$ -	$ -	$ -														
RURAL BROADBAND	$ -	$ -	$ -	$ 20.00														
AS Environmental																		
RIDER E	$ 5,560.00	$ 5,560.00	$ 7.48	$ 3,140.00														
RIDER RGGI	$ -	$ -	$ -	$ 14,358.00														
RIDER CCR	$ -	$ -	$ -	$ 17,670.00														
Additional Resources in Plan B																		
INCREMENTAL GENERIC DSM	$ -	$ -	$ -	$ -														
INCREMENTAL GT PLAN (PHASE 2 + FUTURE PHASES)	$ -	$ -	$ -	$ -														
VCHEC 2045 RETIREMENT	$ -	$ -	$ -	$ -	$ 200.00	$ 630.00	$ 610.00	$ 590.00	$ 590.00	$ 560.00	$ 550.00	$ 520.00	$ 500.00	$ 480.00	$ 450.00	$ 420.00	$ 390.00	$ 360.00
RPS Program-Related Resources Plan B																		
RIDER RPS [4]	$ -	$ -	$ -	$ 1,092.00	$ 2,916.00	$ 7,410.00	$ 8,436.00	$ 11,772.00	$ 11,832.00	$ 8,280.00	$ 8,472.00	$ 8,160.00	$ 7,188.00	$ 4,830.00	$ 5,604.00	$ 6,780.00	$ 4,554.00	$ 5,934.00
RIDER CE [5]	$ -	$ -	$ -	$ 450.00	$ 5,540.00	$ 9,640.00	$ 14,440.00	$ 21,880.00	$ 27,430.00	$ 33,630.00	$ 40,250.00	$ 46,570.00	$ 52,730.00	$ 59,500.00	$ 65,840.00	$ 72,330.00	$ 78,230.00	$ 82,570.00
RIDER CE - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ (438.00)	$ (1,002.00)	$ (4,168.00)	$ (7,236.00)	$ (10,320.00)	$ (13,302.00)	$ (16,890.00)	$ (20,514.00)	$ (23,820.00)	$ (27,540.00)	$ (32,100.00)	$ (36,438.00)	$ (40,728.00)	$ (44,760.00)
RIDER CE - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (1,776.00)	$ (5,166.00)	$ (4,518.00)	$ (3,936.00)	$ (3,438.00)	$ (2,640.00)	$ (3,108.00)	$ (3,630.00)	$ (4,296.00)	$ (4,884.00)
RIDER CE - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ (50.00)	$ (210.00)	$ (750.00)	$ (1,400.00)	$ (2,130.00)	$ (2,910.00)	$ (3,780.00)	$ (4,700.00)	$ (5,720.00)	$ (6,830.00)	$ (8,030.00)	$ (9,280.00)	$ (10,630.00)	$ (12,030.00)
TOTAL RIDER CE	$ -	$ -	$ -	$ 450.00	$ 5,052.00	$ 8,428.00	$ 9,502.00	$ 13,244.00	$ 13,204.00	$ 12,252.00	$ 15,062.00	$ 17,420.00	$ 19,752.00	$ 22,290.00	$ 22,602.00	$ 22,982.00	$ 22,576.00	$ 20,896.00
RIDER PPA [6]	$ -	$ -	$ -	$ -	$ 1,590.00	$ 2,302.00	$ 4,028.00	$ 5,762.00	$ 8,218.00	$ 10,498.00	$ 12,802.00	$ 15,480.00	$ 17,622.00	$ 20,376.00	$ 23,494.00	$ 26,432.00	$ 28,524.00	$ 31,486.00
RIDER PPA - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ (3,816.00)	$ (4,356.00)	$ (5,042.00)	$ (7,644.00)	$ (9,546.00)	$ (11,430.00)	$ (13,170.00)	$ (15,300.00)	$ (17,730.00)	$ (20,040.00)	$ (22,326.00)	$ (24,492.00)
RIDER PPA - REC PROXY	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (2,490.00)	$ (3,018.00)	$ (2,526.00)	$ (2,250.00)	$ (1,896.00)	$ (1,434.00)	$ (1,686.00)	$ (1,962.00)	$ (2,304.00)	$ (2,490.00)
RIDER PPA - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ (310.00)	$ (490.00)	$ (880.00)	$ (1,290.00)	$ (1,750.00)	$ (2,230.00)	$ (2,760.00)	$ (3,350.00)	$ (3,970.00)	$ (4,640.00)	$ (5,340.00)	$ (6,070.00)
TOTAL RIDER PPA	$ -	$ -	$ -	$ -	$ 1,590.00	$ 2,302.00	$ (98.00)	$ 916.00	$ (1,194.00)	$ (1,454.00)	$ (1,020.00)	$ (430.00)	$ (204.00)	$ 292.00	$ 108.00	$ (210.00)	$ (1,446.00)	$ (1,566.00)
RIDER OSW [7]	$ -	$ -	$ -	$ -	$ 5,650.00	$ 7,090.00	$ 16,080.00	$ 25,400.00	$ 30,600.00	$ 48,630.00	$ 46,280.00	$ 51,230.00	$ 50,460.00	$ 58,420.00	$ 67,620.00	$ 71,110.00	$ 89,940.00	$ 85,240.00
RIDER OSW - FUEL BENEFIT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (2,634.00)	$ (20,706.00)	$ (21,360.00)	$ (21,804.00)	$ (22,242.00)	$ (22,944.00)	$ (23,850.00)	$ (27,642.00)	$ (50,736.00)	$ (52,140.00)
RIDER OSW - REC PROXY VALUE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (504.00)	$ (5,862.00)	$ (4,950.00)	$ (3,410.00)	$ (3,036.00)	$ (3,192.00)	$ (3,396.00)	$ (3,924.00)	$ (6,918.00)
RIDER OSW - CAPACITY OFFSET	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (1,390.00)	$ (1,430.00)	$ (1,470.00)	$ (1,510.00)	$ (1,560.00)	$ (1,610.00)	$ (1,650.00)	$ (3,400.00)	$ (3,500.00)
TOTAL OFFSHORE WIND (2 PHASES TOTALING 5,154 MW) [8]	$ -	$ -	$ -	$ -	$ 5,650.00	$ 7,090.00	$ 16,080.00	$ 25,400.00	$ 27,966.00	$ 26,030.00	$ 17,628.00	$ 23,006.00	$ 23,278.00	$ 30,880.00	$ 38,968.00	$ 38,422.00	$ 31,880.00	$ 22,682.00
RPS PROGRAM-RELATED RESOURCES SUBTOTAL	$ -	$ -	$ -	$ 1,572.00	$ 15,208.00	$ 25,230.00	$ 33,920.00	$ 51,332.00	$ 51,808.00	$ 45,108.00	$ 40,142.00	$ 48,156.00	$ 50,014.00	$ 58,292.00	$ 67,282.00	$ 67,974.00	$ 57,564.00	$ 47,946.00
PLAN B TOTAL	$ 350,860.69	$ 312,878.69	$ 309,358.68	$ 370,692.04	$ 369,642.05	$ 402,404.60	$ 419,094.43	$ 435,192.71	$ 455,422.61	$ 459,817.75	$ 459,377.38	$ 467,993.33	$ 474,160.87	$ 493,512.95	$ 507,414.50	$ 523,864.44	$ 526,927.66	$ 518,828.19
CAGR PLAN B (2019 BASE)													2.8%					2.5%
CAGR PLAN B (MAY 2020 BASE)													4.0%					3.3%

[1] Publicly available, annualized tariff rates consistent with filing in Case No. PUR-2021-00058. No future change modeled.
[2] No assumptions modeled for exemptions to Riders OSW & PIPP.
[3] Riders B, R, S, W, BW, GV, US-2, US-3 and US-4.
[4] Includes the cost of purchases plus the cost of the REC proxy value from Company-owned facilities.
[5] Includes CE-1 and CE-2 projects, generic solar, distributed solar, and storage.
[6] Includes CE-2 PPAs, generic solar and storage.
[7] Assumes the build-out of two phases totaling 5,154 MW. Additional details specific to the Phase I CVOW project will be included in a Q4 2021 filing.

2021 RPS Development Plan
Attachment 11: Lifetime Revenue Requirement for Company-Owned Resources

Summary of Lifetime Revenue Requirement
Virginia Jurisdiction Only
($ in Millions)

Calendar Year	Utility Scale Solar	Small Scale Solar	Offshore Wind[1]	Storage	Total Excluding Benefits	Fuel Benefits	REC Proxy Value	Capacity Revenue Offset	Subtotal Benefits	Total Including Benefits
2021	$10	$0	$0	$0	$10	$0	$0	$0	$0	$10
2022	75	0	20	6	101	(3)	0	0	(3)	98
2023	146	11	153	15	325	(10)	0	(5)	(15)	310
2024	256	22	347	33	660	(45)	0	(16)	(61)	598
2025	381	39	549	52	1,021	(78)	0	(30)	(108)	913
2026	468	57	661	67	1,254	(140)	(23)	(46)	(209)	1,045
2027	562	77	1,050	89	1,777	(367)	(73)	(93)	(532)	1,245
2028	661	93	1,000	116	1,869	(412)	(133)	(112)	(658)	1,212
2029	754	105	983	147	1,990	(456)	(114)	(133)	(703)	1,286
2030	841	116	1,090	182	2,229	(496)	(88)	(156)	(741)	1,488
2031	936	125	1,262	220	2,543	(544)	(73)	(181)	(798)	1,745
2032	1,032	130	1,461	260	2,883	(603)	(81)	(208)	(892)	1,991
2033	1,128	134	1,536	300	3,098	(691)	(90)	(236)	(1,017)	2,082
2034	1,216	135	1,943	339	3,633	(986)	(105)	(303)	(1,394)	2,239
2035	1,283	132	1,841	369	3,625	(1,044)	(151)	(335)	(1,531)	2,094
2036	1,314	128	1,753	383	3,578	(1,119)	(173)	(369)	(1,660)	1,918
2037	1,251	124	1,649	375	3,399	(1,159)	(212)	(379)	(1,750)	1,649
2038	1,207	120	1,537	368	3,231	(1,193)	(240)	(390)	(1,823)	1,409
2039	1,169	116	1,443	362	3,090	(1,216)	(258)	(401)	(1,875)	1,215
2040	1,132	112	1,366	359	2,969	(1,250)	(284)	(412)	(1,946)	1,022
2041	1,105	108	1,328	358	2,898	(1,272)	(316)	(427)	(2,014)	884
2042	1,082	104	1,297	356	2,839	(1,296)	(345)	(444)	(2,086)	753
2043	1,061	100	1,276	355	2,792	(1,314)	(378)	(461)	(2,153)	639
2044	1,042	96	1,236	346	2,720	(1,344)	(419)	(478)	(2,241)	479
2045	1,023	92	1,208	316	2,640	(1,365)	(353)	(492)	(2,211)	429
2046	1,004	88	1,203	278	2,574	(1,391)	(365)	(506)	(2,262)	312
2047	987	85	1,177	218	2,467	(1,417)	(380)	(520)	(2,316)	151
2048	970	79	1,154	126	2,328	(1,448)	(395)	(532)	(2,375)	(47)
2049	953	70	1,150	60	2,234	(1,468)	(411)	(542)	(2,422)	(188)
2050	936	62	1,159	53	2,211	(1,495)	(426)	(551)	(2,471)	(261)
2051	905	52	1,195	46	2,197	(1,480)	(438)	(551)	(2,470)	(272)
2052	862	43	605	37	1,546	(1,132)	(432)	(478)	(2,042)	(496)
2053	849	34	617	29	1,529	(1,151)	(326)	(470)	(1,948)	(419)
2054	837	27	602	19	1,485	(1,175)	(330)	(460)	(1,966)	(480)
2055	825	21	596	9	1,451	(1,200)	(334)	(450)	(1,984)	(533)
2056	813	16	605	0	1,434	(1,230)	(339)	(441)	(2,009)	(575)
2057	799	12	634	0	1,446	(751)	(345)	(447)	(1,543)	(97)
2058	781	9	688	0	1,478	(749)	(347)	(445)	(1,540)	(63)
2059	744	7	0	0	751	(703)	(321)	(352)	(1,375)	(625)
2060	666	6	0	0	673	(657)	(196)	(328)	(1,181)	(508)
2061	634	6	0	0	640	(700)	(182)	(302)	(1,184)	(544)
2062	575	6	0	0	581	(636)	(164)	(275)	(1,076)	(495)
2063	515	7	0	0	522	(571)	(147)	(247)	(964)	(443)
2064	455	7	0	0	462	(506)	(129)	(218)	(854)	(392)
2065	394	7	0	0	401	(437)	(112)	(190)	(739)	(338)
2066	334	7	0	0	341	(368)	(95)	(160)	(622)	(281)
2067	274	7	0	0	281	(297)	(78)	(129)	(504)	(223)
2068	214	8	0	0	222	(225)	(62)	(98)	(386)	(164)
2069	156	8	0	0	163	(151)	(46)	(66)	(263)	(100)
2070	94	8	0	0	102	(1)	(30)	(34)	(65)	37
Total	$37,714	$2,959	$39,373	$6,649	$86,695	($39,745)	($10,338)	($14,901)	($64,984)	$21,711

[1] Additional details specific to the Phase I CVOW project will be included in a Q4 2021 filing

EX. SN-3

Independent Statistics & Analysis
U.S. Energy Information Administration

Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies

February 2020

Independent Statistics & Analysis
www.eia.gov

U.S. Department of Energy
Washington, DC 20585

This report was prepared by the U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views in this report therefore should not be construed as representing those of the U.S. Department of Energy or other federal agencies.

Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies

To accurately reflect the changing cost of new electric power generators for AEO2020, EIA commissioned Sargent & Lundy (S&L) to evaluate the overnight capital cost and performance characteristics for 25 electric generator types. The following report represents S&L's findings. A separate EIA report, "Addendum: Updated Capital Cost and Performance Characteristic Estimates for Utility Scale Electricity Generating Plants in the Electricity Market Module (EMM) of the National Energy Modeling System (NEMS)," details subsequent updates to the EMM module.

The following report was accepted by EIA in fulfillment of contract number 89303019-CEI00022. All views expressed in this report are solely those of the contractor and acceptance of the report in fulfillment of contractual obligations does not imply agreement with nor endorsement of the findings contained therein. Responsibility for accuracy of the information contained in this report lies with the contractor. Although intended to be used to inform the updating of EIA's EMM module of NEMS, EIA is not obligated to modify any of its models or data in accordance with the findings of this report.

CASE 22. OFFSHORE WIND, 400 MW

22.1 CASE DESCRIPTION

This case is an offshore wind project with a total 400-MW project capacity. The case configuration assumes wind turbines rated at 10 MW each, located 30 miles offshore in waters with a depth of 100 feet, and assumes a five-mile onshore cable run.

22.1.1 Mechanical Equipment & Systems

The offshore wind project is based on a total project capacity of 400 MW. Parameters that affect project cost and performance include project size, turbine nameplate capacity, water depth, and distance to shore. The case configuration assumes wind turbines rated at 10 MW each. They are located 30 miles offshore in waters with a 100-foot depth. An onshore cable run of five miles is also assumed.

For the purposes of this study, it has been assumed that wind turbines installed employ fixed-type foundation structures; monopile substructures were taken into consideration. Generally, these are installed in relatively shallow waters, not exceeding 150 feet, consistent with our assumption. Water depth and distance to shore has a significant impact on the cost of fixed foundation structure due to the expenses related to cable lengths and installation costs.

Wind turbine generators convert kinetic wind energy into electrical power. The most ubiquitous type of wind turbine used for electric power generation are those of the horizontal-axis three-bladed design. Lift is generated when wind flows around the turbine blades, resulting in rotation. The blades are connected to a central hub and drivetrain that turns a generator located inside of the nacelle, which is the housing positioned atop the wind turbine tower.

22.1.2 Electrical & Control Systems

Each wind turbine consists of a doubly-fed induction generator with high-speed electrical slip rings that produces electricity from the rotational energy of wind. The converter converts DC to AC. The power collection system collects energy from all the wind turbines and increases the voltage to 33–66 kV through a dedicated transformer at the WTG. Array cables, which are buried in the sea floor, transmit electricity to the offshore substation where the voltage is increased to 138 kV. It is then transmitted to an onshore substation via export cables. The power from this substation is supplied for interconnection with the transmission system.

A SCADA system is responsible for communications between the wind turbines and substation. The SCADA system allows the operations staff to remotely control and monitor each wind turbine and the wind project as a whole.

22.1.3 Offsite Requirements

Since wind is a clean source of energy, scope of offsite works is limited to construction of offshore-to-shore submarine cables, port infrastructures, installation vessels (construction and cable laying) and electrical interconnection to the transmission system.

22.2 CAPITAL COST ESTIMATE

The base cost estimate for this technology case totals $4375/kW. Table 22-1 summarizes the cost components for this case.

Capital cost estimates were broken down into the following categories:

- **Civil/Structural Costs:** These costs include the port staging, WTG, and offshore substation foundations.
- **Mechanical Costs:** These costs include the purchase price for the WTGs from the OEM. This price includes the cost of the WTG equipment (blades, hub, drivetrain, generator, tower, and electronics), support vessels, transportation and delivery to port, and erection on site.
- **Electrical Costs:** These cost include interconnection, offshore and onshore transmission that includes inter array cabling, export cabling, and substations.
- **Project Indirect Costs:** These costs include construction management, engineering, and G&A costs.
- **EPC Fee:** The EPC fee is a markup charged by the construction contractor.
- **Project Contingency Costs:** Contingency is an allowance considered to cover the cost of undefined or uncertain scope of work, including EPC change orders or costs associated with schedule delays.
- **Owner Costs:** These costs include Project development costs that cover project feasibility analyses, wind resource assessments, offshore geotechnical and environmental loading studies, obtaining offshore leases, transmission access, and permitting. However, the estimates exclude project financing costs.

Table 22-1 — Case 22 Capital Cost Estimate

Case 22 EIA – Capital Cost Estimates – 2019 $s		
Configuration		**Fixed-bottom Offshore Wind: Monopile Foundations** 400 MW | 10 MW WTG
Offshore Cable Length (mi)		30
Onshore Cable Length (mi)		5
Water Depth (ft)		100
	Units	
[redacted]		
Net Plant Capacity	MW	400
[redacted]		
EPC Contracting Fee	% of Direct & Indirect Costs	10%
Project Contingency	% of Project Costs	10%
Owner's Services	% of Project Costs	5%
Typical Project Timelines		
Development, Permitting, Engineering	months	24
Plant Construction Time	months	12
Total Lead Time Before COD	months	36
Operating Life	years	25
[redacted]		**Total**
Civil/Structural/Architectural Subtotal	$	240,648,000
WTG Procurement and Supply	$	653,008,000
WTG Assembly/Installation	$	125,792,000
Mechanical Subtotal	$	778,800,000
Interconnection	$	60,995,000
Offshore Transmission & eBOP	$	213,947,000
Onshore Transmission	$	60,172,000
Electrical Subtotal	$	335,114,000
Project Indirects	$	74,800,000
EPC Total Before Fee	$	1,429,362,000
EPC Fee	$	85,762,000
EPC Subtotal	$	1,515,124,000
[redacted]	[redacted]	[redacted]
Project Contingency	$	159,088,000
[redacted]	[redacted]	[redacted]
	$/kW net	**4,375**

Capital Cost Notes

1. Costs based on EPC contracting approach. Direct costs include equipment, material, and labor to construct the civil/structural, mechanical, and electrical/I&C components of the facility. Indirect costs include distributable material and labor costs, cranes, scaffolding, engineering, construction management, startup and commissioning, and contractor overhead. EPC fees are applied to the sum of direct and indirect costs.

2. Owner's costs include project development, studies, permitting, legal, owner's project management, owner's engineering, and owner's startup and commissioning costs. Other owner's costs include electrical interconnection costs.

22.3 O&M COST ESTIMATE

Operating expenditures cover all maintenance expenses during operations, including management, labor, equipment and vessel rentals, parts, and consumables for both scheduled and unscheduled maintenance of the WTGs and BOP systems, as well as operations monitoring.

Table 22-2 — Case 22 O&M Cost Estimate

Case 22 EIA – Non-Fuel O&M Costs – 2019 $s		
Fixed-bottom Offshore Wind: Monopile Foundations		
[redacted]		
Subtotal Fixed O&M	$/kW-year	**110.00 $/kW-year**
[redacted]	$/MWh	**0.00 $/MWh**

22.4 ENVIRONMENTAL & EMISSIONS INFORMATION

Wind power projects do not produce regulated environmental air emissions. While other environmental compliance requirements may apply, only air emissions were considered for this report. Therefore, the emissions of NO_X, SO_2, and CO_2 are 0.00 lb/MMBtu.

EX. SN-4

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Second Set

The following response to Question No. 8 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

As it pertains to legal matters, the following response to Question No. 8 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Timothy D. Patterson
McGuireWoods LLP

Question No. 8

Reference page 4 of Company witness Kelly's direct testimony, please clarify whether Figure 1 includes RECs provided by planned new renewable resources, market REC purchases, or other resource additions identified in the Company's 2021 IRP Update. If not, provide a revised analysis of the RPS position for each year including RECs provided from existing and planned new renewable resources, REC market purchases, and RECs from any other resources.

Response:

The Company objects to this request as not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks information or assumptions from the Company's 2021 IRP Update filed in Case No. PUR-2021-00201 that were not used to prepare this filing. Notwithstanding and subject to these objections, the Company provides the following response as it relates to Alternative Plan B that was used to prepare this filing:

Figure 1 on page 4 of Company Witness Kelly's direct testimony does not include RECs provided by potential new renewable resources, other than CE-2 resources and the CVOW Commercial Project, and it does not include purchased RECs. See the Company's response to AG Set 02-29 for additional explanation of modeling methodology used to evaluate the CVOW Commercial Project.

Please see Attachment AG Set 02-08 (DA) for the revised RPS position that includes RECs from potential new renewable resources and purchased RECs in accordance with Alternative Plan B of 2021 IRP Update filed in Case No. PUR-2021-00201.

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Second Set

The following response to Question No. 11 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

As it pertains to legal matters, the following response to Question No. 11 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Timothy D. Patterson
McGuireWoods LLP

Question No. 11

Reference page 6 of Company witness Kelly's direct testimony, please clarify whether Figure 2.1 includes firm capacity provided by planned new renewable resources and other resource additions. If not, provide a revised analysis of the capacity position for each year including planned firm capacity provided from existing renewable, new renewable, and other resources identified in the Company's 2021 IRP Update, along with the underlying capacity data.

Response:

The Company objects to this request as not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks information or assumptions from the Company's 2021 IRP Update filed in Case No. PUR-2021-00201 that were not used to prepare this filing. Notwithstanding and subject to these objections, the Company provides the following response as it relates to Alternative Plan B that was used to prepare this filing:

Figure 2.1 on page 6 of Company Witness Kelly's direct testimony (as revised on December 21, 2021) does not include firm capacity from potential new renewable resources and other resource additions from Alternative Plan B of 2021 IRP Update filed in Case No. PUR-2021-00201. Please see Attachment AG Set 02-11 (DA) CONF for the revised figure and underlying data.

Attachment AG Set 02-11 (DA) CONF contains confidential information, as indicated therein, and is being provided pursuant to the protections set forth in 5 VAC 5-20-170, the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information dated December 13, 2021, any subsequent protective order or ruling that may be issued for confidential or extraordinarily sensitive information in this proceeding, and the Agreements to Adhere executed pursuant to any such orders or rulings.

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Second Set

The following response to Question No. 12 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

As it pertains to legal matters, the following response to Question No. 12 of the Second Set of Interrogatories and Requests for production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Timothy D. Patterson
McGuireWoods LLP

Question No. 12

Reference page 6 of Company witness Kelly's direct testimony, please clarify whether Figure 2.2 includes firm capacity provided by planned new renewable resources and other resource additions. If not, provide a revised analysis of the capacity position for each year including planned firm capacity provided from existing renewable, new renewable, and other resources identified in the Company's 2021 IRP Update, along with the underlying capacity data.

Response:

The Company objects to this request as not relevant or reasonably calculated to lead to the production of admissible evidence in this proceeding to the extent it seeks information or assumptions from the Company's 2021 IRP Update filed in Case No. PUR-2021-00201 that were not used to prepare this filing. Notwithstanding and subject to these objections, the Company provides the following response as it relates to Alternative Plan B that was used to prepare this filing:

Figure 2.2 on page 6 of Company Witness Kelly's direct testimony (as revised on December 21, 2021) does not include firm capacity from potential new renewable resources and other resource additions from Alternative Plan B of 2021 IRP Update filed in Case No. PUR-2021-00201 except for the CVOW Project. See the Company's response to AG Set 02-11 for the revised figure and underlying data.

EX. SN-5

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Second Set

The following response to Question No. 17 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

Question No. 17

Reference page 8, lines 6-9 of Company witness Kelly's direct testimony, please indicate whether each of the analyses discussed in Mr. Kelly's testimony allowed PLEXOS to select the timing and types of all renewable resources to be added to determine the mix of resources that meets VEPCO's customers' capacity and energy needs at the lowest reasonable cost, or whether the Company forced PLEXOS to select the CVOW Project to be added in a certain year as is proposed in this case. If the Company forced PLEXOS to select resources, identify the resources and explain why this was done.

Response:

Consistent with the CE-2/RPS filing modeling methodology in Case No. PUR-2021-00146, the customer NPV of the CVOW Commercial Project was derived as a delta between the "with" and "without" cases to get the value of the CVOW Project against the PJM market. For this reason, the Company instructed PLEXOS to select the CVOW Commercial Project in 2027 in the "with" case and did not instruct it to select it in the "without" case. Furthermore, in both the "with" and "without" cases, the Company instructed PLEXOS to select CE-2 projects, nuclear subsequent license extensions, and new battery storage units to be consistent with Alternative Plan B of 2021 IRP Update filed in Case No. PUR-2021-00201. Finally, the Company removed generic new solar resources from both the "with" and "without" cases to appropriately capture the value of the CVOW Project in PJM market. See the Company's response to AG Set 02-22 for new resource additions in each case.

EX. SN-6

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Second Set

The following response to Question No. 22 of the Second Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on January 28, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

Question No. 22

Reference page 12, lines 15-17 of Company witness Kelly's direct testimony, please provide the resource types and quantities by year selected by PLEXOS for each year of each of the economic analyses of the CVOW Project and alternatives discussed in witness Kelley's direct testimony.

Response:

Per modeling methodology described in the Company's response to AG Set 02-17 and for purposes of the CVOW Commercial Project analysis, PLEXOS was instructed to select CE-2 units, nuclear subsequent license extensions, and battery storage resources consistent with Alternative Plan B of 2021 IRP Update in "without" cases. While in "with" cases PLEXOS was instructed to select the CVOW Commercial Project in 2027 in addition to these units.

See Attachment AG Set 02-22 (DA) for new resource additions in each case.

New Resource Additions (MW)

Base Case without CVOW

	New Solar	New Wind	New Battery Storage	Nuclear License Extensions
2022	15	-	-	-
2023	46	-	20	-
2024	857	-	83	-
2025	-	-	90	-
2026	-	-	120	-
2027	-	-	120	-
2028	-	-	150	-
2029	-	-	180	-
2030	-	-	300	-
2031	-	-	240	-
2032	-	-	240	838
2033	-	-	300	838
2034	-	-	300	-
2035	-	-	330	-
2036	-	-	240	-
2037	-	-	-	-
2038	-	-	-	838
2039	-	-	-	-
2040	-	-	-	835
2041	-	-	30	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	30	-
2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
2050	-	-	-	-
2051	-	-	-	-
2052	-	-	-	-
2053	-	-	-	-
2054	-	-	-	-
2055	-	-	-	-
2056	-	-	-	-

Base Case with CVOW

	New Solar	New Wind	New Battery Storage	Nuclear License Extensions
2022	15	-	-	-
2023	46	-	20	-
2024	857	-	83	-
2025	-	-	90	-
2026	-	-	120	-
2027	-	2,587	120	-
2028	-	-	150	-
2029	-	-	180	-
2030	-	-	300	-
2031	-	-	240	-
2032	-	-	240	838
2033	-	-	300	838
2034	-	-	300	-
2035	-	-	330	-
2036	-	-	240	-
2037	-	-	-	-
2038	-	-	-	838
2039	-	-	-	-
2040	-	-	-	835
2041	-	-	30	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	30	-
2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
2050	-	-	-	-
2051	-	-	-	-
2052	-	-	-	-
2053	-	-	-	-
2054	-	-	-	-
2055	-	-	-	-
2056	-	-	-	-

Sensitivity without CVOW

	New Solar	New Wind	New Battery Storage	Nuclear License Extensions
2022	15	-	-	-
2023	46	-	20	-
2024	857	-	83	-
2025	-	-	90	-
2026	-	-	120	-
2027	-	-	120	-
2028	-	-	150	-
2029	-	-	180	-
2030	-	-	300	-
2031	-	-	240	-
2032	-	-	240	838
2033	-	-	300	838
2034	-	-	300	-
2035	-	-	330	-
2036	-	-	240	-
2037	-	-	-	-
2038	-	-	-	838
2039	-	-	-	-
2040	-	-	-	835
2041	-	-	30	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	30	-
2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
2050	-	-	-	-
2051	-	-	-	-
2052	-	-	-	-
2053	-	-	-	-
2054	-	-	-	-
2055	-	-	-	-
2056	-	-	-	-

Sensitivity with CVOW

	New Solar	New Wind	New Battery Storage	Nuclear License Extensions
2022	15	-	-	-
2023	46	-	20	-
2024	857	-	83	-
2025	-	-	90	-
2026	-	-	120	-
2027	-	2,587	120	-
2028	-	-	150	-
2029	-	-	180	-
2030	-	-	300	-
2031	-	-	240	-
2032	-	-	240	838
2033	-	-	300	838
2034	-	-	300	-
2035	-	-	330	-
2036	-	-	240	-
2037	-	-	-	-
2038	-	-	-	838
2039	-	-	-	-
2040	-	-	-	835
2041	-	-	30	-
2042	-	-	-	-
2043	-	-	-	-
2044	-	-	30	-
2045	-	-	-	-
2046	-	-	-	-
2047	-	-	-	-
2048	-	-	-	-
2049	-	-	-	-
2050	-	-	-	-
2051	-	-	-	-
2052	-	-	-	-
2053	-	-	-	-
2054	-	-	-	-
2055	-	-	-	-
2056	-	-	-	-

EX. SN-7

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Third Set

The following response to Question No. 51 of the Third Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on February 8, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

Question No. 51

Please confirm that the $3.2 billion estimated Societal Cost of Carbon ("SCOC") benefit of the CVOW project is not based on the delta between cases with the CVOW project and cases without the CVOW project, but rather reflects the estimated SCOC value of energy forecasted to be produced by the CVOW project. If confirmed, please explain why this is an appropriate calculation given that, in cases without the CVOW project, VEPCO could replace the CVOW project with other renewable resources that would provide an equivalent SCOC benefit to the CVOW project. If denied, explain how the SCOC benefit of the CVOW project accounts for any benefit provided by replacement renewable energy resources in cases evaluated by VEPCO without the CVOW.

Response:

Confirmed. The SCOC reflects the estimated societal benefit from fossil energy being displaced by the carbon-free CVOW Commercial Project. If solar were built to produce the same MWhs in the same years, it too would produce a similar SCOC benefit.

Virginia Electric and Power Company
Case No. PUR-2021-00142
Office of the Attorney General
Division of Consumer Counsel
Third Set

The following response to Question No. 52 of the Third Set of Interrogatories and Requests for Production of Documents propounded by the Office of the Attorney General, Division of Consumer Counsel received on February 8, 2022, has been prepared under my supervision.

Daria Adamenko
Energy Market Consultant
Dominion Energy Services, Inc.

Question No. 52

Please confirm that the $3.2 million estimated SCOC benefit of the CVOW Project is not a direct cost of providing electric service and will not reduce VEPCO's charges for electric service provided to VEPCO customers.

Response:

Confirmed.

EX. SN-8

The Washington Post Democracy Dies in Darkness

THE CLIMATE 202

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Court ruling on social cost of carbon throws a wrench into Biden's climate plans

By Maxine Joselow
with research by Vanessa Montalbano
February 22, 2022 at 8:08 a.m. EST

Good morning and welcome to The Climate 202! We hope you had a good long weekend.

Our colleague **Anna Phillips**, a national environmental reporter at **The Washington Post**, helped report the top of the newsletter today:

Court ruling on social cost of carbon throws a wrench into Biden's climate plans

A recent court ruling that bars the Biden administration from accounting for the real-world costs of climate change has created temporary chaos at federal agencies, upending everything from planned oil and gas lease sales to infrastructure spending, Maxine reports.

The Feb. 11 decision by a Louisiana federal judge blocked the Biden administration from using a higher social cost of carbon, a key metric that assigns a dollar value to the harm caused by one ton of greenhouse gas emissions. The metric is used in a range of decisions affecting fossil fuel extraction on public lands, infrastructure projects and even international climate talks.

The **Justice Department** said it intends to appeal the Louisiana judge's preliminary injunction. But in the meantime, the ruling could set off a scramble at federal agencies to redo their analyses of major decisions that relied on the higher social cost of carbon, a top Biden administration official warned in a brief filed Saturday.

"The cumulative burden of the Preliminary Injunction is quite significant," wrote **Dominic J. Mancini**, deputy administrator of the **Office of Information and Regulatory Affairs** of the **Office of Management and Budget**. "Regulatory impact analyses and analyses in support of other agency actions are often very complex and time-intensive studies that agencies can spend months developing and refining."

Mancini noted that the **Energy Department** had identified 21 rulemakings that would be affected by the ruling, while the **Environmental Protection Agency** had identified five and the **Interior Department** had pinpointed three. In addition, he said, **Transportation Department** officials had expressed concern about the potential for months-long delays to a grant program for rail and transit projects.

The backstory

The social cost of carbon can be a wonky, confusing issue. To better understand the key climate metric, it's worth reviewing its recent history.

- Under **Barack Obama**, the social cost of carbon was increased to $51 per ton, reflecting a greater emphasis on the harms that greenhouse gas pollution causes to present and future generations.
- But under **Donald Trump**, the figure fell to as low as $1 per ton, reflecting almost no consideration of those climate damages in the analyses underpinning federal decisions.
- Soon after taking office, **President Biden** issued an executive order that tasked an interagency working group with revising the social cost of carbon. The working group last year endorsed an interim number of $51 per ton. **The final number could be as high as $125 per ton.**
- But a coalition of 10 Republican attorneys general sued over the executive order, arguing that Biden lacked the authority to raise the key climate metric without congressional approval. The Louisiana federal judge, a Trump appointee, agreed with the red states in his ruling.

Unintended consequences

The Republican-led states had argued in their lawsuit that the higher social cost of carbon would hamper fossil fuel production on federal lands. But in an ironic and largely unforeseen development, the ruling is having that effect instead.

- Before the ruling, the Interior Department had planned to auction off 179,001 acres of public lands in Wyoming to oil and gas drilling.
- However, officials had used the higher interim social cost of carbon in the environmental analysis underpinning the auction. As a result, Interior last week missed the statutory deadline to announce the sales in the first quarter of this year, prompting criticism from Republicans and industry groups.

"Even in the face of a global energy crisis, historic inflation and skyrocketing gasoline prices, the Biden administration continues to crush U.S. energy production," **Sen. John Barrasso** (Wyo.), the top Republican on the **Energy and Natural Resources Committee**, said in a statement.

Kevin O'Scannlain, vice president of upstream policy at the **American Petroleum Institute**, said in an email that Interior's lapse in leasing announcements "not only violates its statutory obligations, but also complicates efforts to address rising energy costs and ensure our European allies have a stable supply of energy."

Jesse Prentice-Dunn, policy director at the **Center for Western Priorities**, an environmental group, said the Louisiana judge's ruling put Interior in an impossible position when it comes to oil and gas lease sales.

If Interior held a lease sale based on the current environmental analysis, Prentice-Dunn said, it could get struck down in court for relying on the higher interim social cost of carbon. But if the department held a lease sale based on a new environmental analysis without the metric, it could get invalidated for failing to consider the climate effects of drilling on public lands.

"Right now the Interior Department is facing a legal minefield," he said. "It's kind of d---ed if you do, d---ed if you don't."