October 29, 2021

Ms. Carrie Hearne
Associate Director, Energy Equity Programs
Virginia Department of Energy
1100 Bank Street
Richmond, Virginia 23219

Re: Report to the Virginia General Assembly with recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at the least costs to ratepayers and recommendation on whether the General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity

Dear Ms. Hearne:

On behalf of the **Virginia Council on Environmental Justice (VCEJ)**, I wanted to thank you for your outreach and opportunity to provide the Virginia Department of Energy and the other agencies (i.e. Virginia Department of Environmental Quality, State Corporation Commission, etc.) with our comments and policy recommendations on how the Commonwealth should proceed with meeting the Virginia Clean Economy Act's (VCEA) clean energy mandates at the least costs to electric utility customers (ratepayers).

The VCEJ also had the opportunity to review comments submitted by a number of stakeholders including New Virginia Majority, Appalachian Voices, Natural Resources Defense Council, and The Nature Conservancy.

A cleaner energy system will provide important public health, environmental, quality of life, and economic benefits for Virginia's most vulnerable communities, including communities of color, low-income, and other historically underserved communities. However, energy affordability remains a significant burden for many Virginians. As New Virginia Majority noted in their submitted comments, the percentage of household income spent on home energy bills varies widely from region-to-region, by race and income, and is a significant barrier to greater economic justice. The hardship imposed by energy affordability has been further exacerbated by the COVID-19 pandemic and associated economic dislocation.

Our comments respond to the following three research questions, which the agency requested public feedback on during the VCEA decarbonization modeling presentation at our **VCEJ Meeting** on **August 5, 2021** and subsequent meeting of the **VCEJ Infrastructure & Just Transition Subcommittee** on **August 27, 2021**.

(A) Are the key modeling assumptions right to get us on the VCEA trajectory that almost takes Virginia to its carbon-emissions goals by 2045?

(B) What potential additional policy measures should be considered for closing the gap between the decarbonization outcome the VCEA can help Virginia achieve by 2045 and the greater goal of achieving zero emissions economy-wide by then?
(C) What additional matters should the report drafters take into account?

VCEJ would like to provide the following comments and questions regarding key modeling assumptions with respect to carbon emission goals by 2045 and additional policy measures to help VCEA meet the decarbonization goal by 2045 and the greater goal of achieving zero-emissions economy-wide:

1. **Energy efficiency:** *Model scenarios should incorporate energy efficiency into the model alongside solar, wind, and other resources as a resource to achieve the least-cost pathway. Additionally, scenarios should be modeled to determine potential energy savings to electric customers if the energy efficiency targets extend beyond the 2025 schedule and are set at higher annual savings levels*.

2. Natural gas plants: *The model assumes that the current natural gas capacity increases slightly by 2025, reflecting planned builds, but at least one of the two planned natural gas combined-cycle plants have been cancelled. Additionally, plant capacity in the model remains constant through 2040 despite uncertainty in new builds and lack of demonstrated need for new gas plants. Maintaining these aging, inefficient plants through 2040 will be expensive and adds harmful air pollution to vulnerable communities. Given the uncertainty in new builds and the lack of demonstrated needs for new gas plants, we believe the model should optimize for no new fossil capacity*.

3. **Energy storage costs:** *As battery prices have decreased in recent years, modeled battery price assumptions should be revisited. As comments from other stakeholders have noted, it is unclear what battery energy storage costs are being incorporated in the model and are likely high. At a minimum, a low-storage-price sensitivity should be run*.

4. **Distributed energy resources (DERs):** *The Haiku model does not appear to currently differentiate between utility-scale and distributed energy resources (DERs*) *Distributed generation is essential to implementing the VCEA at least-cost to ratepayers. In addition to helping Virginia achieve it's decarbonization goals and reduce emissions, distributed generation programs including multifamily and community solar programs can assist those with the highest energy burdens and costs. Development of distributed generation is also critical for utilities to equitably meet the VCEA's requirements for citing renewable energy facilities in historically economically disadvantaged communities (HEDCs)]*.

5. **Third-Party Ownership:** *The VCEA includes a 35% carve-out for third-party-owned infrastructure. This is not only important for non-profit and other community organizations that want to pursue their own energy projects, like community solar, but many large companies have expressed commitments to reduce their carbon footprint by purchasing renewable energy. At the previous VCEJ Subcommittee meeting, we asked "Do you have any approximation on the*

difference in overall costs if we allowed more third-party ownership? Can we let the model run different third-party ownership scenarios?" At the time, the response was that this could be reflected in the modeling. We would like to receive an ***update*** *on this matter.*

Policy Recommendations:

Certificate of Public Convenience and Necessity: *The Virginia General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity. This is consistent with Virginia's goal to reduce emissions while maintaining reliability using zero-carbon generation. Under Section 56-585.5 B, all investor-owned utility power plants that emit carbon dioxide must retire. Additionally, under Section 10.1-1308, the Air Pollution Control Board must enact rigorous regulations to reduce carbon dioxide from all other power plants, regardless of fuel type, by 2050. Any new fossil-fired power plant constructed in Virginia will almost certainly be forced to retire earlier than its full useful life, leaving customers (ratepayers) saddled with enormous stranded asset costs, especially in disadvantaged communities already experiencing financial hardship with an undue and avoidable economic burden.*

Thanks again for providing the opportunity for us to provide comments to the Virginia Department of Energy's clean energy modeling.

Sincerely,

Clarence Tong
Chair, Infrastructure & Just Transition Subcommittee
Virginia Council on Environmental Justice

William F. Stephens
Director
(804) 371-9611
FAX (804) 371-9350

PO Box 1197
Richmond, Virginia 23218-1197

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

DIVISION OF PUBLIC UTILITY REGULATION

September 27, 2021

Carrie Hearne
Associate Director, Energy Equity Programs
Virginia Department of Mines, Minerals & Energy
1100 Bank St, Suite 8,
Richmond, Virginia 23219

Re: SCC Staff Supplemental Comments concerning 9/2/21 DMME decarbonization modeling presentation

Dear Ms. Hearne:

Attached please find the SCC's Staff's Supplemental Comments related to DMME's recent presentation of its electric generation decarbonization modeling. Should you have any questions about these comments, you may contact me at (804) 371-9766 or by e-mail at Bill.Stephens@scc.virginia.gov.

Sincerely,

William Stephens

Commonwealth of Virginia
STATE CORPORATION COMMISSION

September 27, 2021

MEMORANDUM

To: **DMME**

From: **SCC Staff**

Re: **SCC Staff Supplemental Comments concerning 9/2/21 DMME decarbonization modeling presentation**

The comments below are provided by the SCC Staff ("Staff") to DMME in response to DMME's presentation to Staff, on September 2, 2021, of its modeling and analysis to date ("Presentation"). These comments also constitute the SCC's entire consultation, to date, with the Secretaries of Commerce and Trade and Natural Resources ("Secretaries") in the course of the Secretaries' preparation of the VCEA-required report to the General Assembly on recommendations on how to achieve 100 percent carbon-free electric generation by 2045 at least cost to ratepayers ("Report").[1] The Enactment requires that the Report be prepared in consultation with the SCC, the Council on Environmental Justice and appropriate stakeholders.[2]

During the Presentation, Staff answered questions posed by DMME representatives and their consultants and also offered comments and observations about the modeling and analysis. This memo re-caps Staff's comments, and provides additional observations and suggestions for DMME's consideration in the Report's development. The modeling and

[1] This Report is required by the 6th enactment of the VCEA ("Enactment").

[2] The Enactment further requires that the Report address whether the General Assembly should permanently bar the ability to obtain certificates of public convenience and necessity ("CPCNs") for any carbon-emitting electric generating unit.

analysis presented appeared somewhat preliminary in nature; thus, Staff's comments and suggestions below are intended to assist DMME's continued development of the Report, and to ensure that the SCC provides sufficient guidance within its areas of expertise as anticipated by the Enactment. In that regard, the SCC Staff would welcome an opportunity to consult further as DMME works through details preparatory to completing the Report.

Modeling Overview.

DMME utilized the Haiku model. The Haiku model as understood by Staff is a policy model intended to simulate a national electricity market[3] and is primarily used to identify least-cost solutions for various types of environmental policy goals such as controlling emissions of NO_X, SO_2 , CO_2, and mercury. This differs from the generation planning models used by utilities such as Strategist, Plexos, and Aurora. Generation planning modeling performed by utilities utilizes least-cost optimization techniques to identify the least-cost generation mix. These models simulate each utility's generation and transmission system including the physical limitations of interacting with the Regional Transmission Organization that dispatches the utility's generation. Dominion's 2020 IRP,[4] 2021 IRP Update and 2020 RPS filings along with APCo's 2020 RPS filing reflects each utility's modeling of compliance with the VCEA. As such, these filings could be valuable resources to validate and cross check DMME's modeling assumptions.[5]

[3] Physical and statutory constraints preclude a single national market for electricity. The Western and Eastern Interconnections are separated by the Rocky Mountains and both are separated legally from the Texas Interconnection.

[4] On March 9, 2020, the Commission issued an initial Order in the Dominion 2020 IRP Case that directed Dominion to model the costs and reliability impacts of the VCEA in its 2020 IRP that was required to be filed May 1, 2020. Dominion complied with this directive but was unable to update its energy price forecasts to reflect the impacts of the build-out of renewable and energy storage resources contained in the VCEA.

[5] Information contained in these utility filings, including energy demand and commodity price forecasts provided by Staff and intervenors, can be a valuable resource to check on the validity of the model inputs used by DMME such as: energy and peak load forecasts; commodity price forecasts; capital costs and variable operating costs of dispatchable, storage, and renewable generation resources; and average and peak capacity factors used for storage and renewable resources.

Costs to ratepayers and rate impacts.

As noted above, the Enactment requires the Report to the General Assembly to provide recommendations on how "to achieve 100 percent carbon-free generation by 2045 at least cost for ratepayers." During the Presentation, Staff was advised that the modeling of generation mixes, power plant capacities and emissions (with additional sensitivity modeling to reflect high demand) through 2040 produced least cost results. However, only one VCEA compliant plan, which included *only* the generation determined by the VCEA to be "in the public interest," was modeled. Staff notes that there are multiple potential combinations of renewable generation and energy storage resources that could achieve the VCEA's stated goals. Further, for the plan that was modeled, the modeling results do not present any costs of the plan or rate impacts to ratepayers. Staff recommends that the Report's focus on a transition to a decarbonized generation fleet by 2045 "at least cost for ratepayers" include an investigation of the least-cost combination of renewable generation and energy storage resources along with an estimate of the costs of the plan and rate impacts to ratepayers to fulfill the legislation's requirements.[6]

The modeling presented stops at 2040 without removing all fossil fuel units.

The DMME slides of modeling undertaken, to date, do not show modeling through 2045—the date by which 100 percent carbon-free generation is to be attained by the VCEA and required to be presented in the Report. Instead, the modeling concludes at 2040, still showing carbon-emitting generation as part of Virginia's generation mix. Staff recommends modeling through 2045 in order to address how a decarbonized generation fleet can be achieved by that date—and at what cost—as required by the Enactment.

DMME Modeling inputs.

The Presentation included a slide titled "Important Reference Case Assumptions." However, a broader and better understanding of the modeling results would be gained by identifying all key modeling inputs. As an example, Staff understands that assumptions

[6] In its February 1, 2021 Final Order in Dominion's 2020 IRP Case, the Commission similarly directed Dominion, in future IRP and Update filings, to model a least-cost VCEA plan that would meet (i) applicable carbon regulations and (ii) the mandatory RPS Program requirements of the VCEA.

concerning "demand" were not entirely drawn from EIA information as suggested on the reference case assumption slide. One of the modeling analysts stated that the EIA numbers had been adjusted to reflect the analysts' additional assumption concerning higher EV penetration and growth in data center development within the Commonwealth. Staff would recommend that more specific information about these additional demand assumptions, as well as other key modeling inputs, should be provided in the Report to aid in its evaluation by the General Assembly. For example, what are the levelized costs of energy for solar and wind used in the model? Were distinctions made between the assumed costs of company-developed versus third party developed solar? These and other inputs should be identified in the Report as a means of providing a better understanding of its findings and conclusions.

Reliability.

The modeling results shared with Staff and presented again in the public forum on September 9 did not include potential impacts of the planned decarbonization of the electric generation fleet by 2045 on reliability, i.e., the reliable delivery of electric generation to electric customers. Further, extreme weather events such as the 2014 polar vortex were not included in the modeling to test system reliability. Since "least cost" necessarily encompasses reliable electric service, Staff would recommend that this issue be analyzed and addressed in the Report. Consultation with PJM may be beneficial.

Transmission Costs.

One issue raised by Staff during the Presentation was transmission costs. The planned decarbonization of the electric generation fleet by 2045 necessarily entails associated transmission costs necessary to interconnect new, carbon-free generation sources. One example identified by Staff was the substantial, on-shore transmission improvements necessary to incorporate DEV's anticipated off-shore wind installation into the grid once it has been transmitted to shore by submarine cable(s).[7] The Dominion off-shore units were modeled, but

[7] As well as the publicized proposed interconnection of a project off North Carolina whose lines would also come ashore in Dominion's southeast Virginia service area.

without the associated on-shore transmission upgrade costs. PJM, the regional transmission operator, has recently estimated that the upgrade costs for off-shore wind and solar contained in the VCEA may run as much as $1.9 billion.[8] Other examples would include the costs of transmission construction for on-shore wind projects, and potentially those for utility-scale solar projects that cannot be supported by distribution infrastructure. In addition, the model did not include a transmission import/export constraint. In order to maintain system reliability, additional transmission lines may be required to import greater amounts of energy from PJM.[9] Staff recommends that the Report analyze transmission needs/costs associated with this transition to 2045. Consultation with PJM may prove beneficial in this regard.

Capacity factors.

The Report should clearly distinguish between modeled generations' nameplate capacities versus the expected average annual and coincident peak capacity factors used in the modeling. It should also recognize that the capacity figures PJM credits for renewable resources to determine a member's reserve margin requirements are considerably lower than capacity nameplates.

EV sensitivity.

The modeling assumed little impact on energy demand from converting ≥ 90% of Virginia's internal combustion engine ("ICE") fleet to EVs, i.e., a forecasted EV penetration of 90% by 2045.[10] Dominion estimates provided to Staff, however, indicate that charging an EV requires 3,000 to 4,000 kWh per year. Thus, a home with 2 EVs would consume an additional 6,000 to 8,000 kWh annually. Assuming an average household's annual electricity usage at approximately 13,000 to 14,000 kWh, this would add a substantially higher load than DMME's

[8] This $1.9 billion also includes the costs of transmission upgrades in Virginia associated with planned off-shore wind development off the North Carolina coast.

[9] In particular, during a polar vortex winter event, the daily peak occurs in the pre-dawn hours when solar is not generating, which may require additional transmission import capability to maintain system reliability.

[10] The EV penetration assumed is a DMME modeling sensitivity.

modeling estimates.[11] Staff would recommend that DMME revisit this issue in its further modeling and development of the Report.

Inviting Consumer Counsel and other groups representing ratepayers to review modeling results.

The Office of the Attorney General's Division of Consumer Counsel ("Consumer Counsel") regularly appears in Commission proceedings to represent Virginia's electric utility consumers (of all types), and to present financial, economic and rate analyses on their behalf. Staff highly recommends that this modeling be shared with Consumer Counsel at DMME's earliest opportunity, and with other groups that participate in Commission electric utility dockets. Inasmuch as the VCEA directs the Secretaries together with "appropriate stakeholders" to produce the Report on meeting the VCEA goals at "least cost," consumer representatives' participation should be deemed to be "appropriate."[12]

Moratorium on fossil fuel units.

Staff was asked during the Presentation for its view about whether the VCEA-established current moratorium on CPCNs for carbon-emitting electric generation (expiring upon the delivery of the Report in January 2022) should be made permanent. The Enactment requires the Secretaries to address this issue in their Report. Staff emphasized that reliability must be fully taken into account when addressing this question. Staff would reiterate the importance of doing so.

Staff also noted in the discussion, that even absent the moratorium, the VCEA has established substantial preconditions to the construction of new carbon-emitting facilities. In particular, the VCEA directs, in amending Code § 56-585.1 A 5, that "[n]otwithstanding any

[11] Dominion's estimate is consistent with an EV using 24 kWh per 100 miles and the average mileage of 14,200 miles driven annually in Virginia per car. According to the US Department of Energy website fueleconomy.gov, the most efficient EV is the Tesla Model 3 Standard, which consumes 24 kWh per 100 miles driven.

[12] If DMME has not yet consulted with the electric utilities, they should immediately do this as well.

other provision of law, unless the Commission finds in its discretion and after consideration of all in-state and regional transmission entity resources that there is a threat to the reliability or security of electric service to the utility's customers, the Commission shall not approve construction of any new utility-owned generating facilities that emit carbon dioxide as a by-product of combusting fuel to generate electricity unless the utility has already met the energy savings goals identified in § 56-596.2 and the Commission finds that supply-side resources are more cost-effective than demand-side or energy storage resources."[13] (Note however, that this statute applies only to “utility-owned” generation and not to merchant plants.)

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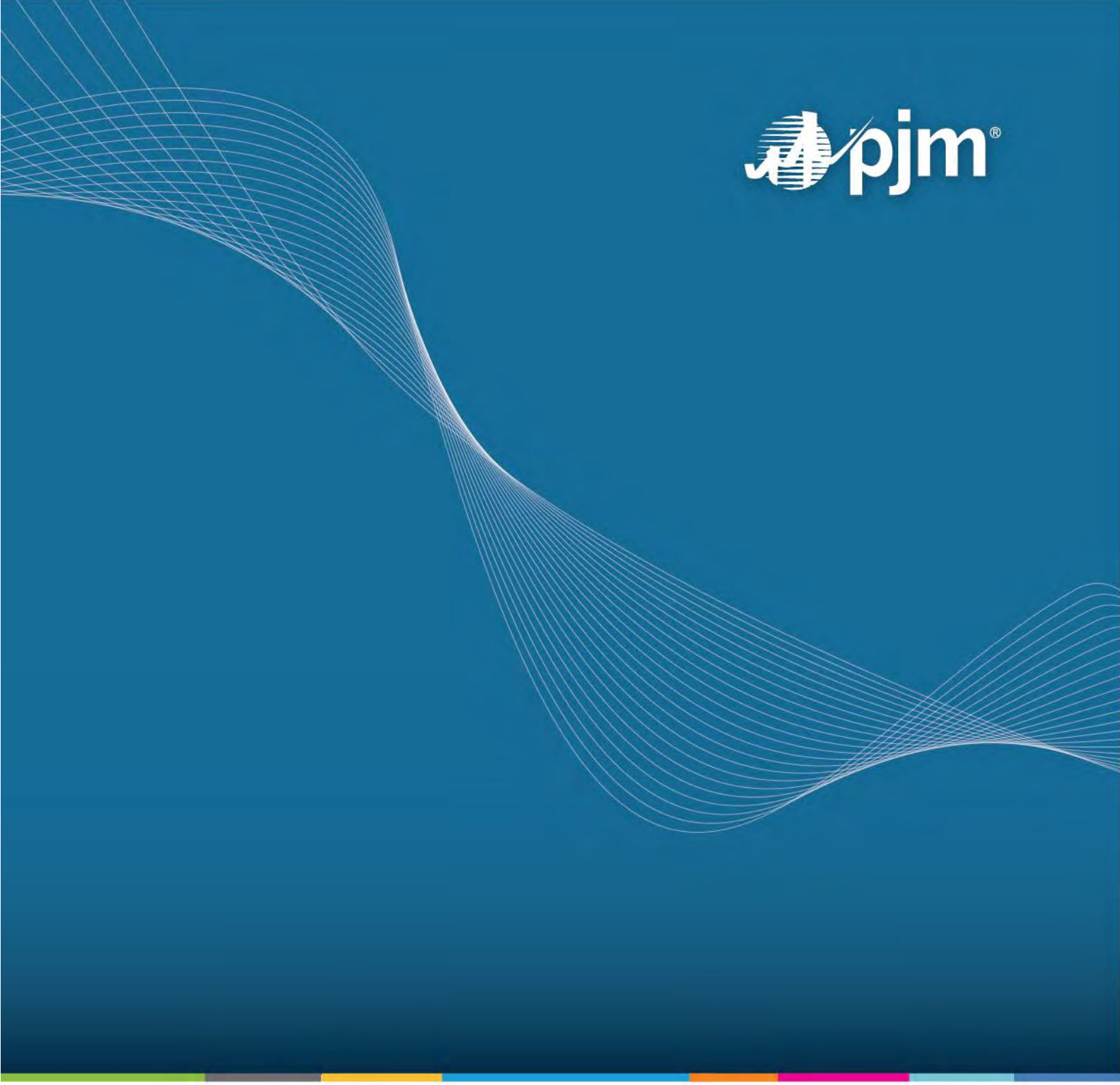
[13] Additionally, amendments to § 56-585.1 A 6 direct the Commission to (i) require a "social cost of carbon" analysis in connection with its reviewing applications for approval of any generation, and (ii) consider a proposed facility's potential to have a "disproportionate adverse impact on historically economically disadvantaged communities." These requirements are not specific to carbon-emitting generation, but are noted for completeness.



PJM Comments for the VA Decarbonization Report

PJM Interconnection, LLC

October 8, 2021

For Public Use

PJM Interconnection ensures the reliable flow of power to 65 million customers in Virginia, as well as 12 other states and Washington, D.C. As such, we're responsible for ensuring reliable and efficient delivery of electricity over the bulk electric system to one-fifth of the nation.

The PJM grid consists of 85,103 miles of transmission lines and approximately 1,200 generation sources, along with more than 500 demand response and energy efficiency providers. We are interconnected with our neighboring systems in the Eastern Interconnection, which geographically includes over two-thirds of the United States and Canada. PJM delivers power from the high-voltage transmission grid to local distribution utilities, who then are responsible for delivery to end-use customers.

The PJM region is made up of diverse states and communities with equally diverse policies impacting the bulk electric power grid. Many of these policies focus on clean-energy issues, including in-state generation, renewable portfolio standards, zero-emission credits, carbon pricing and offshore wind auctions, in addition to electrification goals. Job growth and economic development are tied into clean-energy policies as well. Cumulatively, these policies are driving an increase in renewable power generation, new technologies like energy storage, and retirements of traditional thermal generation. It is important for PJM to understand the impacts and complexities of this grid of the future now, so that there is adequate time for PJM to work with all stakeholders and policymakers to enable this transition in an efficient and reliable manner.

As such, PJM is participating in related research efforts that may provide some useful information for the Virginia Department of Energy as it prepares its report regarding recommendations on how to reach Virginia's decarbonization goals with the least cost to ratepayers.

Integration of Renewables

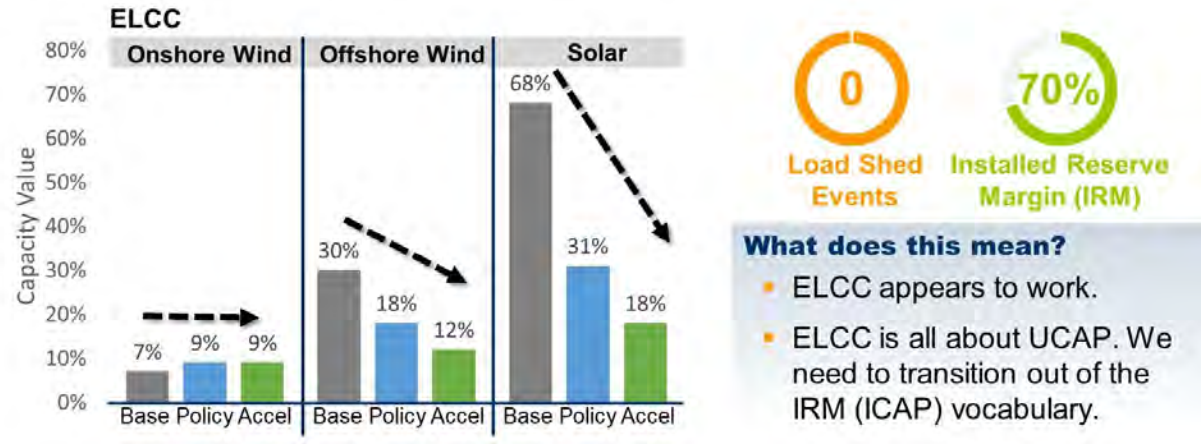
PJM is studying the impacts of the grid of the future and the integration of a large amount of renewable resources onto the PJM system, Overview of PJM's Reliability and Renewable Integration Analyses. As part of this analysis PJM analyzed three scenarios:

- Base: The amount of wind, solar, battery energy storage and solar-storage hybrid resources anticipated in the most current Regional Transmission Expansion Plan.
- Policy: References state and corporate clean-energy targets for 2035, which combined would result in 22% of the energy in the PJM footprint coming from renewable generation, with the ability to provide up to 90% of PJM's instantaneous load.
- Accelerated: References additional state and corporate clean-energy targets extending to 2050, which combined would result in 50% of the energy in the PJM footprint coming from renewable generation, with the ability to provide 30% more energy than PJM's instantaneous load.

An important point from this study for consideration in Virginia's efforts to decarbonize the electricity system by 2045 is that in order to maintain reliability, the Installed Reserve Margin will be much higher due to the Effective Load Carrying Capability (ELCC) of renewable resources, which will require significant infrastructure (both generation and transmission) buildout in a short time frame.

Effective Load Carrying Capability

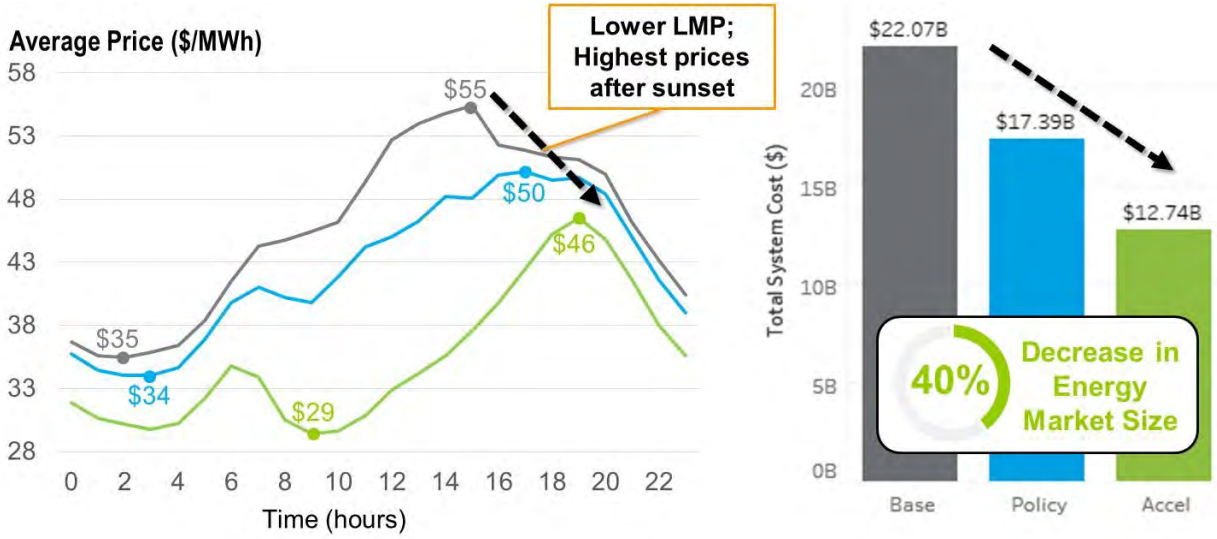
Figur



Maintaining Balancing Resources

Additionally, this initial research shows (see figure below) that the resulting decrease in Locational Marginal Prices will significantly decrease the size ($) of the energy market, which will see a significant decline in revenue to resources needed to balance the system. PJM will require regulatory support for accommodating state policies regarding the generation resource mix while also ensuring that we have the products (and adequate compensation to providers) in place, in a timely manner, to meet the reliability needs of the system.

Figure 2. LMP and Size of Energy Market

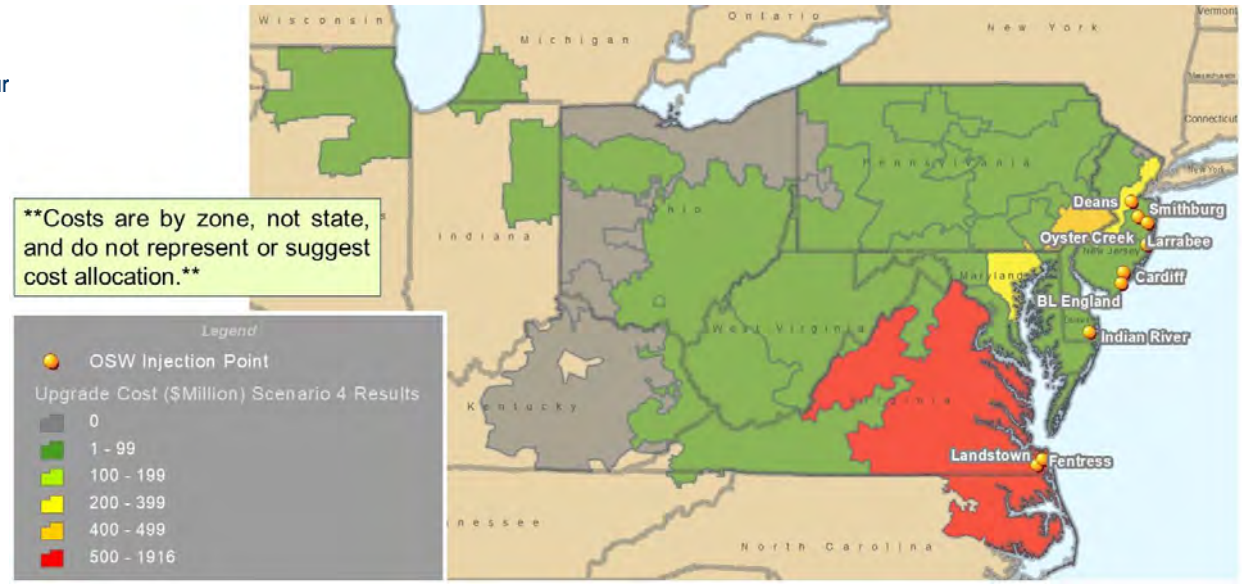


Significant Infrastructure Requirements

At the request of the Organization of PJM States, Inc., PJM analyzed and identified transmission solutions across the PJM region to accommodate the coastal states' offshore wind goals and PJM states' RPS requirements, which are shown in Offshore Transmission Study Group Phase 1 Results. Upgrades required to facilitate meeting 2035 state renewable portfolio standards and offshore wind targets range from $2.5 billion to $3.2 billion. Offshore wind injections studied ranged from 12,400 MW to 17,000 MW. This points to the importance of coordination in order to develop the significant amount of infrastructure needed to meet decarbonization timelines.

Upgrade Cost Estimate by Zone

Figur



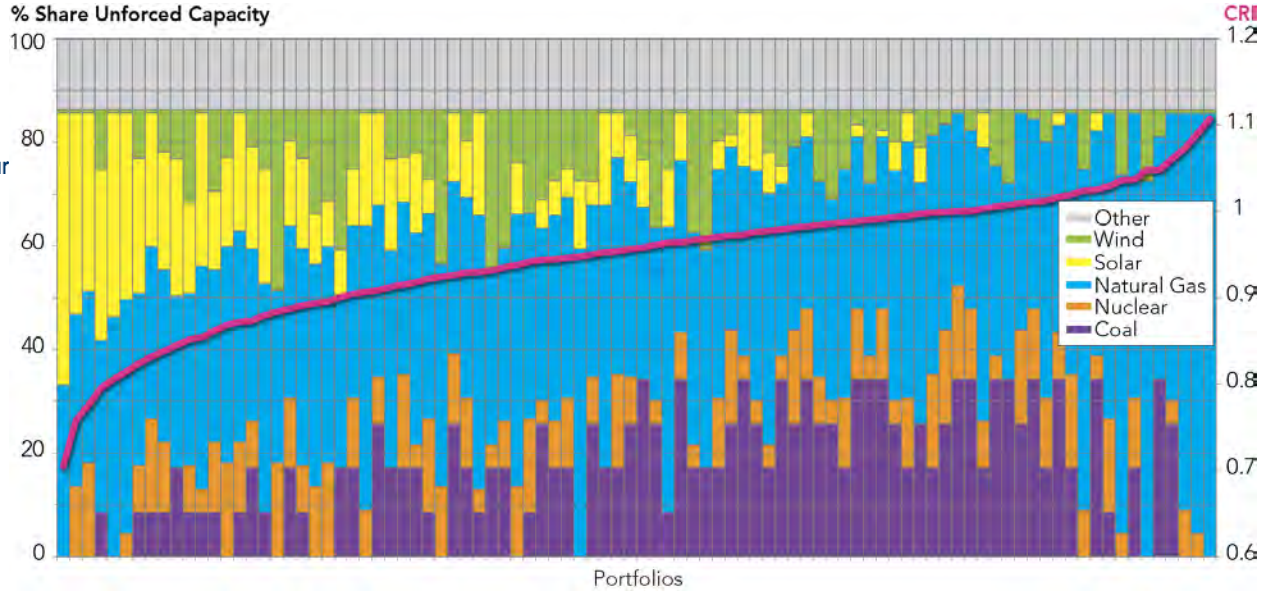
Resource Attributes Needed to Maintain System Reliability

In 2017, PJM evaluated the changing resource mix in PJM given environmental regulations, the preponderance of low-cost natural gas, the increasing penetration of renewable resources and demand response, and the potential for retirements of nuclear power resources. Specifically, in this study, PJM's Evolving Resource Mix and System Reliability, we examined whether the resource attributes necessary to maintain system reliability would continue to be available in sufficient quantities within various potential future resource portfolios. PJM noted (see table below) a marked decrease in performance was observed for portfolios made up of significant increases in wind and solar capacity, due to the decrease in frequency response, reactive capability and fuel assurance attributes, suggesting performance-based upper bounds on capacity exist for these resource types.

Nevertheless, it was determined that PJM can maintain reliability with unprecedented levels in PJM of wind and solar resources, assuming a portfolio maintains a sufficient amount of reliability services, which PJM is addressing through ELCC. ELCC ensures that the capacity contribution of intermittent resources is determined accurately so that adequate resources are maintained for reliability. As such, the road to a decarbonized electricity grid should promote a diverse set of resources with the needed attributes to ensure reliability.

Diversity Mix Results

Figur



Growing Interdependence

PJM recently participated in the Eastern Interconnection Planning Collaborative's (EIPC) Planning the Grid for a Renewable Future white paper. PJM is part of EIPC along with 18 other planning authorities from the eastern and central United States that make up the Eastern Interconnection of the North American transmission grid. EIPC's white paper is designed to explain both the opportunities and challenges of integrating an increasing amount of renewables on the grid to assist policymakers in developing policies that ensure the ongoing reliability and affordability of electricity.

"Different jurisdictions have a long history of mutual support, but as wind and solar resources grow, the broader grid becomes more interdependent and will demand enhanced collaboration among all parties. … [G]rowing interdependence requires sufficient time for system planners and operators to conduct the necessary analyses to determine and implement appropriate adaptations to recognize the changing nature of the fleet."

The EIPC offered the following three recommendations, which are explained in greater detail in the white paper:

Enhance Policy Coordination Across Planning, Cost Allocation and Siting — Enhancing planning alone will do little to manifest the significant transmission needed to achieve a high-renewable future unless policymakers also deal with the issues of:

- Who pays for the new transmission (referring to the allocation of the costs of the project among different customers)
- Challenges in siting new transmission, including issues of property rights, land use, and environmental and social justice

Establish a System of Monitoring and Course Correction as Events Unfold — Any policy initiative clearly provides regulators, the industry and stakeholders the opportunity to both monitor and correct course in a timely fashion if a particular path is leading to unnecessarily higher costs, limited choice for customers or negative reliability impacts. System planners and grid operators are available to provide the ongoing monitoring and identification of emerging issues that may trigger discussion of possible course corrections.

Enhance Collaboration — Past experience has many good examples of cooperation to ensure that public policy and the physics of the power system work harmoniously together. As the pace of change continues to accelerate, it is more important than ever to work more proactively together. The EIPC recommends that policymakers considering renewable portfolio standards, carbon dioxide standards or other similar energy-related goals take the affirmative step of inviting system planners and operators to provide input — in a clear and explainable form — as to the full-range of planning and operational challenges, costs and trade-offs associated with the proposed set of standards. Understanding the full range of implications can be extremely challenging, which sometimes more high-level analyses used in the legislative process can overlook.

In Conclusion

PJM has a long tradition of collaboration with the Commonwealth of Virginia on issues relating to energy and the environment. We appreciate the opportunity to provide input to the Virginia Department of Energy as it prepares its report regarding recommendations on how to reach Virginia's decarbonization goals with the least cost to ratepayers.

PJM ensures reliability through our markets, operations and regional transmission planning and through the significant efforts of our member companies. PJM is committed to accommodating state policy choices, and as we progress toward the grid of the future together, we must do so with reliability at the core of our common purpose and with careful consideration of the costs customers will be asked to pay.

Edward H. Baine
President
Dominion Energy Virginia

600 East Canal Street, Richmond, VA 23219
DominionEnergy.com

October 13, 2021

Virginia Department of Energy
Washington Building
1100 Bank St #817
Richmond, VA 23219

Re: Decarbonization Public Comment

Dear Virginia Department of Energy:

I am writing on behalf of Dominion Energy Virginia ("Dominion Energy" or "the Company") to provide comment on the report required by enactment clause 6 of the Virginia Clean Economy Act ("VCEA"). Through the VCEA, the Commonwealth of Virginia has set some of the most ambitious clean-energy targets in the country. These include development goals for solar, wind, and energy storage facilities, as well as a mandatory renewable energy portfolio standard and energy efficiency resource standard. The law also recognizes the importance of reliability and security of electric service. Dominion Energy is embracing a diverse energy generation portfolio that will enable us to make a transformational pivot to clean energy without compromising on our public service obligation to reliably serve customers every second of every day, 365 days per year.

Dominion Energy is likewise dedicated to maintaining affordability. Historical data show that the Company's electric rates have remained relatively stable over the past decade, increasing year-over-year at well below the rate of inflation. As of October 1, our typical residential customer in Virginia (i.e., one who uses 1,000 kilowatt-hours of electricity per month) receives a monthly bill of $117.77—in other words, they pay an all-in rate of about 11.78 cents. That rate is more than 15% below the most recent national average reflected in federal data and also compares favorably to relevant regional averages.

The Company has expanded our in-state solar portfolio from about one megawatt in 2015 to over 1,000 megawatts in-service today. Several thousand more megawatts of solar generation facilities are under development, including a historically large slate of Company-owned solar facilities and third-party power purchase agreements recently submitted for regulatory approval. Through 2035, we anticipate expanding our Virginia solar fleet by at least another 13,700 megawatts, consistent with the VCEA.

We are also developing the largest offshore wind farm in the country—the 2.6-gigawatt Coastal Virginia Offshore Wind (CVOW) Commercial Project—27 miles off the coast of Virginia Beach to serve homes and businesses in the Commonwealth. It is our vision that offshore wind, which will generate peak energy at night and during winter months, will complement our rapidly expanding fleet of solar resources which produce the most output

during midday hours in the spring and summer months. Even so, additional investments will be required to mitigate the inherent intermittency of solar and wind resources.

Energy storage projects will support capturing excess solar and wind generation, allowing the energy to be redeployed to better match supply and demand on an hourly basis. Dominion Energy Virginia has received regulatory approval for four battery-storage pilot projects, and we plan to expand the availability of energy storage through solar plus storage projects, non-wires alternatives, electric school buses, and other potential technologies. We also operate the largest pumped-hydro energy storage facility in the world, the 3,003-megawatt station located in Bath County, Virginia.

We also must recognize the important role of nuclear energy in the Commonwealth's clean-energy future. Since 1972, Dominion Energy has been an industry leader in providing customers with safe, reliable, zero-carbon nuclear energy. This on-demand resource ensures a reliable, around-the-clock power supply regardless of weather conditions. Without it, achieving 100% carbon-free electricity by 2045 would be costly, if not impossible. The Company is therefore pursuing one of the most cost-effective means to limit greenhouse gas emissions by extending the lives of our existing nuclear facilities in Virginia—Surry Power Station and North Anna Power Station. Taken together, these baseload resources comprise about 33% of Dominion Energy Virginia's generation mix and produce roughly 90% of our carbon-free energy. The Company is actively exploring opportunities to deploy next-generation nuclear technologies, such as small modular reactors, to complement our growing portfolio of intermittent renewable resources.

Of course, generation is just one part of Dominion Energy Virginia's strategy to significantly reduce greenhouse gas emissions. The Company is modernizing the energy grid with zero-emission and smart technologies and expanding energy efficiency offerings for our customers. These investments will support the proliferation of new renewables, ensure reliability and security, and increase access to cost-effective demand-side management programs, including demand response programs. These investments will also enable innovative energy grid solutions resulting from the electrification of the transportation sector, such as vehicle-to-grid technology.

For the next 15 years, these strategies will contribute substantial progress toward achieving the objectives of the VCEA, reducing carbon dioxide emissions from electric operations in Virginia even as our customers' energy needs increase. However, after 2035, Virginia's ability to continue progressing toward 100% carbon-free electricity by 2045 will require supportive legislative and regulatory policies, advancements in technology, and broader investments across the economy.

That is why we are actively exploring innovative technologies and technological improvements that are likely to make the transition to clean energy more feasible while also ensuring reliability for our customers. The Company regularly assesses emerging energy technologies, including multi-day energy storage, carbon capture and sequestration, and green hydrogen for various energy applications. While Dominion Energy has not yet deployed these technologies, it may be possible to deploy one or more in the future, including as pilot programs, if and when they mature and demonstrate reliability and economic feasibility.

As the Virginia Department of Energy develops recommendations for how the Commonwealth of Virginia can reach its decarbonization goals at least cost to customers, the Company encourages the Department to consider similar roles and opportunities for innovations that may make the transition to clean energy more feasible while also ensuring reliability for customers.

In addition, the Company encourages the Department to consider the direct and indirect impacts of least cost and alternatives on the transmission and distribution grids. The energy grid needs significant upgrades to accommodate the bi-directional flow of power resulting from the expansion of solar, onshore wind, and energy storage. Due consideration will also need to be given to the potential power quality/voltage mitigation issues that can be experienced by the change in generation resources. As more renewable resources are added to the energy grid to displace traditional generation, preserving black start capability is also critical, especially given increasing concerns of cybersecurity attacks.

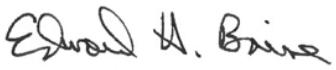
The Company also believes that, as we continue to transition to clean energy sources, careful attention must be given to the communities and local economies that will be impacted by traditional generation unit retirements. Any recommendations for achieving the Commonwealth's clean energy goals should include a focus on inclusion and social equity—including the importance of ensuring that these communities, especially historically economically disadvantaged communities, share in the economic development benefits which result from the ongoing clean-energy transition.

Finally, the Company urges the Department to fully consider the potential reliability impacts of a permitting moratorium on carbon-emitting electric generation units. Dominion Energy welcomes a future where renewable energy and energy storage technologies advance to the point where they can fully displace traditional carbon-emitting electric generation without compromising safety, reliability, or affordability. However, given current technological, operational, and economic limitations of various energy storage technologies, as well as the intermittent nature of wind and solar resources, such a measure could compromise long-term reliability and security of electric service while also jeopardizing innovations that may be needed to make the transition to clean energy more feasible.

At Dominion Energy, our vision and mission are clear: We aim to build a clean and sustainable energy future while continuing to provide our customers with safe, reliable, and affordable electricity around the clock. Those objectives have served us well for many years and will continue to guide us in the years ahead.

We appreciate the opportunity to provide comment and look forward to the ongoing conversation on the decarbonization of Virginia's electricity sector.

Sincerely,



Edward H. Baine
President, Dominion Energy Virginia

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October 13, 2021

Carrie Hearne
Associate Director, Energy Equity Programs
Virginia Department of Energy
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Via email to modeling@energy.virginia.gov

RE: Report to the General Assembly under Virginia Clean Economy Act Enactment Clause 6

Dear Ms. Hearne:

Appalachian Voices is a 501(c)(3) nonprofit organization dedicated to a just and equitable transition to a clean energy economy. We respectfully submit the following stakeholder comments related to the report and recommendations required under Enactment Clause 6 of the Virginia Clean Economy Act of 2020.[1]

Requirements Under the VCEA

Enactment Clause 6 of the Virginia Clean Economy Act (VCEA) requires the Secretaries of Commerce and Trade and Natural Resources to report to the General Assembly "any recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at least cost for ratepayers."[2] The VCEA also requires one very specific recommendation regarding "whether the General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity."[3]

It is important to note that the VCEA does not prescribe any particular methodology for generating the recommendations on how to achieve a

[1] 2020 Va. Acts Ch. 1194, *available at* https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1194.
[2] *Id.*
[3] *Id.*

carbon-free electric sector at least cost, nor does it require that any particular assumptions be used in that analysis.

The Virginia Department of Energy has worked with consultants at the Georgetown Climate Center, Resources for the Future, and the University of Virginia ("Consultants") to create a model and assumptions to guide this work.[4]

The Consultants created a model that starts with two questions: (1) what are the carbon emission pathways for the Virginia electricity generation sector if the VCEA is implemented, and (2) what additional measures, if any, are required to achieve zero carbon emissions from the sector by 2045 (at least cost)?[5]

While it is very useful for policymakers to have a reference case in which the VCEA is fully implemented, this is merely instructive and does not in and of itself respond to the directive in Enactment Clause 6. The usefulness of the reference case lies largely in showing policymakers how close (or far) from zero emissions full implementation of the VCEA will land—and at what cost. The utility of the reference case is likely to increase if it turns out that additional or faster emissions reductions—or significant ratepayer savings—may result from relatively minor adjustments to the policy.

However, full implementation of the VCEA through 2045 should not be assumed as reality. First, as detailed below, it is likely that at least some of the utility investments anticipated by the VCEA will not be approved by the State Corporation Commission (SCC). Second, the VCEA itself, like all laws, is subject to changes made by the General Assembly. These changes could be very minor, or they could be significant. One example of a significant change in policy is a restructured electricity market in which retail electricity sales are competitive and decoupled from wires services. This policy change should not be considered "out of scope" for this modeling exercise if its analysis produces a reasonable alternative recommendation to "achieve 100 percent carbon-free electric energy generation by 2045 at least cost for ratepayers." This may be an extreme example, but the point is that the question posed by Enactment Clause 6 is incredibly important—and no attachment to any current policy should stand in the way of delivering the best possible answer.

Policymakers Should Not Assume that the SCC will Approve All VCEA Clean Energy Investments

The VCEA requires Virginia's two largest investor-owned utilities, Appalachian Power Co. and Dominion Energy, to petition the SCC for approval of 16,700 MW of solar and land-based wind

[4] *See* VA. DEPT. OF ENERGY, GETTING TO CARBON-FREE ELECTRIC GENERATION AT LEAST COST TO VIRGINIA RATEPAYERS (Sept. 9, 2021), *available at* https://energy.virginia.gov/environmental/documents/Decarbonization-Presentation-Public-Meeting.pdf.
[5] *Id.* at 12.

projects.[6] However, the law does not require the SCC to approve these proposals. Recent SCC precedents indicate that the Commission strongly prefers third-party-developed projects to utility-owned projects. For example, in approving Dominion's application for the Coastal Virginia Offshore Wind (CVOW) project, the Commission emphasized that, due to the fact that Dominion's captive customers bear nearly all of the risk, and because the proposed costs were uncompetitive and uncertain, the "proposed CVOW project would not [normally] be deemed prudent ... under any common application of that term."[7]

Moreover, the SCC has denied cost recovery for "grid modernization" projects proposed by Dominion Energy under the Grid Transformation and Security Act of 2018 twice, finding that many of the proposals were not supported by evidence that any potential customer benefits could justify the high costs.[8]

This illustrates a key tension in creating a clean energy economy quickly and at lowest cost within the existing regulatory paradigm. The SCC's authority to determine whether IOU-proposed costs are reasonable and prudent is one of the only protections standing between Virginia ratepayers and monopoly prices. Because customers do not have a choice in energy provider, the speed of the clean energy transition relies rather heavily on the quality of the proposals Virginia's IOUs submit to the SCC. The more cost-effective and customer-beneficial, the more likely the projects are to be approved.

Another key tension lies within local permitting: to the extent that localities fail to approve special or conditional use permits for large clean energy facilities, the amount of new clean energy projects—and the speed of their deployment—are likely to fall short of the VCEA's goals. For example, the Culpeper County planning commission has twice recommended denial of a proposed 149 MW solar facility (whose energy would be purchased by Dominion), in large part due to a county ordinance limiting solar facilities to 300 acres.[9]

> ***Recommendation:*** *Model Virginia's clean energy transition with something less than full approval of the IOU-owned clean energy investments envisioned by the VCEA—perhaps model results under the assumption that two-thirds of the proposals receive approval. Then ask: what additional policies are needed to reach 100 percent carbon-free electricity generation, and how might those investments be*

[6] Va. Code Ann. § 56-585.5 D.
[7] Va. State Corp. Comm'n, Final Order, Case No. PUR-2018-00121 8-10, 15 (Nov. 2, 2018), *available at* https://scc.virginia.gov/docketsearch/DOCS/4c%24z01!.PDF.
[8] *See* Va. State Corp. Comm'n, Final Order, Case No. PUR-2019-00154 (April 27, 2020), *available at* https://scc.virginia.gov/docketsearch/DOCS/4ml%4001!.PDF; Va. State Corp. Comm'n, Final Order, Case No. PUR-2018-00100 (Jan. 17, 2019), *available at* https://scc.virginia.gov/docketsearch/DOCS/4dv801!.PDF.
[9] The proposed 149 MW facility would require 1,700 acres. Allison Champion, *Still too big: Culpeper planners deny Maroon solar application for second time*, CULPEPER STAR EXPONENT, Mar. 11, 2021, https://starexponent.com/news/still-too-big-culpeper-planners-deny-maroon-solar-application-for-second-time/article_d92e788a-77f3-5760-b167-bdfa29771595.html#tracking-source=home-top-story-1.

financed? One possibility is the implementation of a national Clean Electricity Payment Plan.[10]

Utility Ownership versus Third Party Ownership

In contrast to the CVOW project noted above, the SCC has favored third-party ownership of clean energy resources in recent history. In approving a proposal to purchase energy from a third-party-owned solar facility via a power purchase agreement (PPA), the SCC praised the fact that "[t]he Project's developer—not Dominion's customers—bears almost all of the risks."[11] The project was the result of "an extensive and transparent competitive bidding process," and "[c]ustomers will not have to pay a return on investment for any of the Solar PPA costs."[12] Under Virginia law, when an IOU purchases the energy, capacity, and environmental attributes from a third party through a PPA, costs are treated as "fuel" and recovered via the fuel recovery rider *with no rate of return*.[13] Accordingly, third-party ownership of clean energy resources can reduce ratepayer costs significantly.

To illustrate the point more starkly, Delegate Sally Hudson asked the staff of the SCC to calculate the impact that approval of the VCEA's offshore wind, solar and onshore wind, and energy storage procurement requirements would have on Dominion's ratepayers.[14] The VCEA does require that 35% of the clean energy procurements proposed by Virginia's IOUs be third-party purchases,[15] so the SCC's response calculated the cost of 10,000 MW of solar, rather than the full 16,100 MW required by the VCEA.

According to the SCC, 10,000 megawatts of Dominion-owned solar resources would cost customers approximately $30.1 billion, including roughly $8.2 billion in company-retained profits over the life of the projects. By contrast, if the same amount of solar were purchased from third parties via PPAs, "Dominion Energy would charge customers for the contractual cost of solar generation purchased," and "Dominion Energy would not receive any profit margin on the sale of the solar generation purchased through a PPA."[16]

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[10] "The $150 billion CEPP would offer grants to utilities that increase their year-on-year share of clean energy by at least 4 percentage points; it would charge fines to utilities that fall short of that goal. ("Utilities" here includes any and all end-use electricity providers: vertically integrated utilities, investor-owned utilities, co-ops and munis, etc.)" David Roberts, *A close look at the clean energy legislation offered by House Democrats*, VOLTS (Sept. 15, 2021), https://www.volts.wtf/p/a-close-look-at-the-clean-energy.

[11] Va. State Corp. Comm'n, Final Order, Case No. PUR-2018-00135 4-6 (Nov. 2, 2018), *available at* https://scc.virginia.gov/docketsearch/DOCS/4c%24y01!.PDF.

[12] *Id.*

[13] Va. Code Ann. §56-249.6.

[14] *See* Letter from SCC Division of Utility Accounting & Finance to Del. Hudson (Feb. 24, 2020) (Attached).

[15] Va. Code Ann. § 56-585.5 D.

[16] Letter from SCC Division of Utility Accounting & Finance to Del. Hudson (Feb. 24, 2020) (Attached).

Between Dominion's VCEA-anticipated investments in offshore wind, solar and onshore wind, and energy storage, the SCC calculated an estimated *$12.5 billion in profits alone* that Dominion's customers would pay over the lives of the facilities—costs that would be avoided entirely if 100% of the resources were purchased from third parties.[17] Now it is unreasonable to assume that Virginia's IOUs will own *none* of the clean energy facilities required for the transition to a zero-carbon electricity sector (presumably purchasing all energy and environmental attributes from third parties instead). However, any serious attempt to model a zero-carbon electricity sector "at least cost for ratepayers" must analyze policy scenarios that reduce the percentage of new clean energy resources owned by IOUs.

> ***Recommendation:*** *Model the VCEA clean energy procurement proposals using different requirements for third-party ownership. While the law requires proposals with 35% third-party ownership, policymakers should understand the potential ratepayer savings that could be realized under scenarios with 50%, 65%, or even 75% third-party ownership of the new clean energy resources.*

Modeling Distributed Energy Resources

Recent modeling from consultant Vibrant Clean Energy (VCE) concluded—somewhat counterintuitively—that large investments in distributed energy resources (DERs), particularly rooftop solar, community solar, and distributed energy storage, is the cheapest way to transition to a clean energy economy by mid-century.[18] VCE's lead, Christopher Clack, developed a new modeling tool capable of analyzing more granular data points in the distribution system. Deploying this new tool, Clack's team found that adding 247 gigawatts of small-scale solar and 160 gigawatts of distributed energy storage to the U.S. grid would save $473 billion on a system that reduces electric sector carbon emissions 95% from 1990 levels.[19]

The study analyzed four scenarios: (1) business as usual (BAU); (2) business as usual augmented with detailed modeling of the distribution-utility interface (BAU-DER); (3) a nationwide clean energy standard scenario (CE); and (4) the clean energy scenario augmented with detailed modeling of the distribution-utility interface (CE-DER).[20] Because the task here is to decarbonize the electric sector at least cost to ratepayers, the most important comparison is the cost of achieving a clean energy standard (CE) versus achieving that standard while optimizing for DERs (CE-DER). In the VCE study, costs of CE-DER were higher than the cost of CE

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[17] *See id.*
[18] Josh Rosenfeld, *Expanding Local Solar and Storage Could Save Ratepayers Nearly Half a Trillion Dollars* (Dec. 1, 2020), https://www.vibrantcleanenergy.com/wp-content/uploads/2020/12/LocalSolarRoadmapPressRelease_FINAL.pdf.
[19] *Id.*
[20] CHRISTOPHER CLACK, ET AL., WHY LOCAL SOLAR FOR ALL COSTS LESS: A NEW ROADMAP FOR THE LOWEST COST Grid 24 (2020), *available at* https://www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_TR_Final.pdf.

through 2025, but by 2030 the DER-optimized scenario produced cost savings relative to CE, ultimately saving $473 billion by 2050.[21] Average electricity retail rates are 4% lower in 2050 when the clean energy scenario is optimized with DERs.[22]

Stunningly, optimizing DERs was cheaper than BAU. Compared to BAU, BAU-DER produced lower average electricity retail rates. Compared to CE, CE-DER was cheaper. Given the higher per-kilowatt-hour cost of distributed clean energy versus utility-scale clean energy, this result is surprising; however, this phenomenon cannot be ignored as Virginia models its own carbon-free electricity grid.

While the VCE study analyzes the entire U.S. electricity sector, the new distribution-utility interface tool can be deployed in other models—and Clack encourages it. An interview with the consultant revealed that "it's just four paragraphs of code that open [his model] up to distribution grids," and "other models, including the models that utilities use in planning, could easily replicate this."[23] Clack says "[o]ne of the reasons I was so keen on having it be relatively simplistic is, it should be able to be adopted by other models."[24]

During a September 9, 2021 public webinar summarizing the current modeling of Virginia's clean energy goals, members of the Consultants team advised that utility-scale clean electricity generation would not behave differently in their Haiku model from distributed clean electricity. One member of the team, however, conceded that DERs could make a difference to the rates that individual households are paying. It bears repeating that this is exactly the mandate of VCEA Enactment Clause 6: to make "recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 *at least cost for ratepayers*."[25] The VCE team has developed a tool that is available today to other modelers across the country—one that is likely to reveal least-cost pathways to decarbonization by optimizing DERs.[26] The Virginia Department of Energy should use it.

Recommendations:

1. *Incorporate Vibrant Clean Energy's code to optimize DERs when modeling Virginia's carbon-free electricity sector.*

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[21] *Id.* at 32.
[22] *Id.* at 33.
[23] David Roberts, *Rooftop solar and home batteries make a clean grid vastly more affordable,* VOLTS (May 28, 2021) https://www.volts.wtf/p/rooftop-solar-and-home-batteries.
[24] *Id.*
[25] 2020 Va. Acts Ch. 1194, *available at* https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1194 (emphasis added).
[26] As discussed above, smaller-scale clean energy resources may also have an advantage over utility-scale resources in terms of local permitting. At a small enough scale, including rooftop, DERs may avoid special and conditional use permitting entirely, allowing them to deploy more rapidly.

2. *Model a policy case in which the RPS for Virginia's electric utilities includes a requirement that 10% of electricity demand be met with DERs.*[27]

Policymakers Should Enact a Moratorium on New Carbon-Emitting Facilities

The one recommendation required by VCEA Enactment Clause 6 is whether or not carbon-emitting electric generating facilities should be able to receive permits going forward. Given that as recently as 2019, 64% of net electricity generation in Virginia was fueled by natural gas or coal,[28] and given that the typical service life of a modern natural gas-fired electric generation unit is 40 years,[29] it is intuitive that no new carbon-emitting facilities may be permitted in Virginia if the emissions goals of the VCEA and Governor Northam's Executive Order 43 are to be met.[30] The International Energy Agency warned in a report this May that in order to mitigate the most catastrophic effects of global warming, nations must stop approving new coal plants and new oil and gas extraction fields *this year*.[31] Moreover, the IEA states that a pathway to some measure of climate stability would require the world's advanced economies to achieve net zero carbon emissions from their power sectors by 2035.[32] For economic reasons alone, approving a 40-year asset that must be stranded 14 years from now is a ludicrous proposition.

During the September 9, 2021 webinar, the Consultants noted that—even though their Haiku model does not actively choose to add carbon-emitting generation—the model and the VCEA itself do not quite achieve zero emissions from Virginia's power sector by 2045 (let alone 2035). As discussed above, however, the way utilities and the SCC behave in real life are far more important than what a 20-year model of a recently enacted law tells us. The reality is that the SCC is still authorized to approve certificates for new carbon-emitting electric generating facilities for both IOUs and merchant generators.[33] Because there is no economic risk to captive

[27] For purposes of this policy case, anaerobic digestion resources should not qualify. *But see* Va. Code Ann. § 56-585.5 C.
[28] U.S. ENERGY INFORMATION ADMIN., *Virginia State Profile and Energy Estimates* (Oct. 13, 2021), https://www.eia.gov/state/?sid=VA#tabs-4.
[29] *See* Josh Saul, *New Gas Plants Threaten Carbon Hangover Long Past Biden Deadline*, BLOOMBERG GREEN, May 21, 2021, https://www.bloomberg.com/news/features/2021-05-21/lifespan-of-new-u-s-gas-plants-exceeds-net-zero-climate-goals. ("The new gas plant, and others like it, has a 40-year lifespan. That means it will still be there in 2035, the year that President Joe Biden has promised a zero-emission electricity sector, and in 2050, the deadline set by its owner, Southern Co., to reach carbon neutrality.").
[30] Gov. Northam, Exec. Order 43 (Sept. 16, 2019) ("The Director of [the Virginia Department of Energy]…shall develop a plan of action to produce…one hundred percent of Virginia's electricity from carbon-free sources by 2050.").
[31] INT'L ENERGY AGENCY, NET ZERO BY 2050 (3d rev. July 2021), *available at* https://www.iea.org/reports/net-zero-by-2050.
[32] Brad Plumer, *Nations Must Drop Fossil Fuels, Fast, World Energy Body Warns*, N.Y. TIMES, May 18, 2021, https://www.nytimes.com/2021/05/18/climate/climate-change-emissions-IEA.html.
[33] While the VCEA places limitations on approval of new IOU-owned carbon-emitting generation (see social cost of carbon analysis under Va. Code § 56-585.1 A 6**)**, the law does not limit approval of merchant-owned carbon-emitting units at all.

ratepayers for the investments of merchant generators, the SCC has typically approved certificates for these types of carbon-emitting units.[34]

Unfortunately, Virginia cannot subtract (emissions) through addition (of emissions). Therefore, policymakers should provide a clear directive that new proposals for carbon-emitting power generators will not be approved.

> ***Recommendation:*** *the Virginia General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon* as *a by-product of combusting fuel to generate electricity.*

Thank you for the opportunity to provide comments on this critical report.

Sincerely,

Peter Anderson
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[34] *See* Va. State Corp. Comm'n, Final Order, Case No. PUR-2017-00033 11 (May 8, 2018), *available at* https://scc.virginia.gov/docketsearch/DOCS/4c%24y01!.PDF (approving a CPCN for natural gas-fired power station Chickahominy Power, LLC because, among other things, "the business risk associated with constructing, owning, and operating the Facility, which will not provide retail electric service in the Commonwealth and will not be included in the rate base of any incumbent electric utility, rests solely with CPLLC.").

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STATE CORPORATION COMMISSION
DIVISION OF UTILITY ACCOUNTING AND FINANCE

February 24, 2020

The Honorable Sally L. Hudson
Pocahontas Building, Room W429
900 East Main Street
Richmond, Virginia 23219

Dear Delegate Hudson:

I am writing in response to your request to the State Corporation Commission concerning House Bills 1526 and 1664 ("HB 1526" and "HB 1664"). Please see below for answers to your questions.

(1) HB1526 and HB1664 both provide that the costs associated with offshore wind (OSW) facilities up to 3,000 MW will be presumed reasonable and prudent if certain criteria are satisfied.

a. If Dominion builds a 3,000 MW OSW facility, how much money (in 2020 dollars) would Dominion recover from Virginia customers over the expected service life of the facility? We can include operations, maintenance, and financing costs in the estimate; assume a 9.2% rate of return on common equity; and assume costs are recovered through rate adjustment clauses.

Answer: Staff has quantified the impact on a typical residential customer bill for Dominion Energy's construction of 2,600 MW of offshore wind. Dominion Energy would collect approximately $15.5 billion from Virginia customers based on its preliminary estimates of capital investment, operations, maintenance, decommissioning and financing costs. We are not aware of Dominion Energy having any cost estimates to build 3,000 MW of offshore wind.

b. What would be the total equity return (i.e. profit) from that facility?

Answer: The profit retained by Dominion Energy over the life of the facility would be approximately $3.2 billion after taxes.

c. If, instead, Dominion were to purchase the output from a third-party 3,000 MW OSW facility via a power purchase agreement (PPA), what would be the total equity return (i.e., profit) over the service life of that facility?

Answer: Dominion Energy would charge customers for the contractual cost of offshore wind purchased from a third party through a PPA. Dominion Energy would not receive any profit margin on the sale of the offshore wind purchased through a PPA.

(2) HB1526 provides that by 2036, Dominion will construct, acquire, or purchase the output from 16,100 MW of solar or onshore wind facilities in Virginia. The bill also provides that 65% of those capacity additions will be utility owned.

a. Under these conditions and the assumptions in (1)a, how much money would Dominion recover from Virginia customers over the expected service life of those facilities?

Answer: Staff has quantified the impact on a typical residential customer bill for Dominion Energy's construction of approximately 10,000 MW of solar generation. Dominion Energy would collect approximately $30.1 billion from Virginia customers based on its preliminary estimates of capital investment, operations, maintenance and financing costs. Estimates of decommissioning costs for solar have not been provided to Staff at this time.

b. What would be Dominion's total equity return from those facilities?

Answer: The profit retained by Dominion Energy over the life of the facility would be approximately $8.2 billion after taxes.

c. If, instead, Dominion were to purchase 100% of that output from third-party solar facilities via PPAs, what would be the total equity return over the service life of those facilities?

Answer: Dominion Energy would charge customers for the contractual cost of solar generation purchased from a third party through a PPA. Dominion Energy would not receive any profit margin on the sale of the solar generation purchased through a PPA.

(3) HB1526 provides that by 2036, Dominion will construct or acquire at least 2,700 MW of energy storage capacity. The bill also implies that 65% of the storage facilities will be utility owned and 35% will be owned and operated by third parties.

a. Under these conditions and the assumptions in (1) a, how much money would Dominion recover from Virginia customers over the expected service life of those facilities?

Answer: Staff has quantified the impact on a typical residential customer bill for Dominion Energy's acquisition of approximately 1,700 MW of battery storage. Dominion Energy would collect approximately $5.2 billion from Virginia customers based on its preliminary cost estimates of capital investment, operations, maintenance and financing costs.

Estimates of decommissioning costs for battery storage have not been provided to Staff at this time.

b. What would be Dominion's total equity return those facilities?

Answer: The profit retained by Dominion Energy over the life of the facility would be approximately $1.1 billion after taxes.

c. If, instead, Dominion were to purchase the output from a third-party 2,700 MW storage facility, what would be the total equity return over the service life of that facility?

Answer: Dominion Energy would charge customers for the contractual cost of battery storage purchased from a third party. Dominion Energy would not receive any profit margin from the use of battery storage purchased from a third party.

Please let me know if you have any other questions.

Sincerely,

Kimberly B. Pate
Director Utility Accounting and Finance

framatome

October 13, 2021

To: Virginia Energy

RE: Decarbonization Public Comment

Dear Sir or Madam,

I am writing on behalf of Framatome Inc. to provide comments on the Commonwealth's plan for decarbonization. Framatome is a leader in nuclear energy recognized for its innovative solutions and value-added technologies for the US commercial nuclear fleet. With worldwide expertise and a proven track record for reliability and performance, the company designs, services and installs components, fuel, and instrumentation and control systems for nuclear power plants. With over 1500 employees in the Commonwealth, Framatome's North America headquarters are based in Lynchburg. We appreciate the opportunity to highlight the importance of nuclear energy in Virginia's decarbonization plan.

Decarbonization is at the center of the Virginia Clean Economy Act, which passed in 2020 and aims to fully decarbonize Virginia's electricity grid by 2045. Nuclear energy should have a prominent place alongside growing shares of wind and solar production in the Virginia plan to achieve 100% carbon-free generation. Nuclear energy is far and away Virginia's largest zero-carbon generating resource, and the technology will remain an important source of clean energy and well-paying jobs for decades to come.

Currently, nuclear energy provides 32% of the total electricity generation in the Commonwealth and 95% of Virginia's carbon-free energy. Nuclear energy is a foundational electricity resource and an economic driver for the Commonwealth that needs to remain a central component into the future. Any policy recommendations must maintain the existing carbon free nuclear fleet in Virginia and allow for new nuclear construction in the years to come to ensure reliable, affordable clean energy generation.

Virginia's nuclear energy companies are leaders in technology innovation, manufacturing and construction. By preserving existing nuclear power plants and creating a policy framework that could allow for construction of a new generation of nuclear energy facilities, Virginia can strengthen its position as a nuclear energy leader and add to the thousands of well-paying nuclear industry jobs in the state.

Inclusion of nuclear energy in any and all discussions of clean carbon-free energy is consistent with legislation passed in the 2020 legislature:

- SB 828 Carbon-free energy and clean energy; definition
- SB 817 Nuclear energy; considered a clean energy source

This legislation recognized the invaluable role that nuclear is already playing in reducing Virginia's carbon emissions and directed the state to work to continue and strengthen that relationship. The Virginia Nuclear Energy Consortium, working with the government of the Commonwealth, developed a multi-year strategic plan (*2020-2024 Virginia is Nuclear Strategic Plan)* to provide

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framatome

input for Virginia's on-going energy strategy and reaching its carbon goals. We recommend considering this plan in the decarbonization plan.

Thank you for your consideration and please call on Framatome for any additional discussion of how carbon free nuclear energy will be a part of Virginia's plan for reaching 100% carbon-free energy by 2045.

Sincerely,

Tom DePonty
Director, Government Affairs
Framatome Inc.

framatome

October 9, 2021

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Virginia Energy
1100 Bank St.
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It is NRDC's honor to submit inaugural comments to **Virginia Energy**, as that crucial institution continues its invaluable engagement with the Commonwealth's already-costly[1] and increasingly complex energy regulations. Virginia Energy's fresh credibility, unbiased insight, and unique expertise makes it an indispensable voice to cut through any noise and clearly identify for policymakers the least costly, most equitable means of reducing climate pollution from power plants. We therefore also thank Virginia Energy for thoughtfully considering the comments and recommendations herein, as it prepares its findings and least-cost recommendations, so that the General Assembly can accurately weigh its next steps on behalf of all Virginians.

I. Recommendations on VCEA Compliance Options

The importance of Virginia Energy's report and recommendations to the General Assembly cannot be overstated, as this is the Commonwealth's own first opportunity to provide unalloyed clarity on the VCEA's complex interplay of directives, and its wide variety of potential compliance pathways and associated costs.

To that end, **we recommend** the report clearly elucidate to the General Assembly – and to the layperson public -- what options are available for utility compliance with the VCEA's carbon-reduction requirements, and those compliance options' relative cost-effectiveness. (E.g. new utility construction of variable resources and storage resources to reduce the capacity factor of the state's new carbon-intensive NGCC fleet; third-party resources; business-as-usual coal retirements; forced retirements; energy efficiency-based demand reductions; allowance purchases.) A clear-eyed summation of the ways Virginia might comply with the VCEA, and their relative cost efficiencies, will educate policymakers on the range of potential ratepayer impacts and available reforms.

On the matter of providing clarity around ratepayer costs, we also **recommend** that Virginia Energy provide policymakers with a clear baseline of rates and bills as they already exist in

[1] *See, generally,* U.S. Energy Information Administration data, to compare statewide and utility-specific rates and bills, available here.

Virginia today. To do so in the most relevant and unbiased manner, the report to the General Assembly should simply rely on already-public EIA data, to usefully compare Phase I and II utility rates and bills to the most relevant, comparable utilities. Those apples-to-apples utilities are the following: (1) every regulated, vertically-integrated utility in every neighboring state that is also regulated, and (2) all "peer group" utilities to which Phase I and II utilities compare themselves before the SCC. Providing that clear and relevant comparison of rates and bills would be a first for Virginia policymakers, who typically hear non-useful comparisons to non-contiguous states, or to the national average (which is particularly irrelevant, due to nationally varying regulatory regimes; a wide disparity of geography and climate; and the distorting inclusion of outlier states like Alaska and Hawaii).

In sum, any assessment of cost impacts would be incomplete without providing a baseline of current costs in relation to comparable utilities.

II. Recommendations on Efficiency-based Compliance and Related Cost Savings

For the purposes of identifying a lower range of potential compliance costs, **we recommend** a sensitivity assuming Virginia adopts a robust energy efficiency standard that by 2030 achieves savings that equal those of today's leading efficiency states. This is a particularly important sensitivity, given that one of the most cost-effective means of compliance – energy efficiency – is largely missing in Virginia's new generation-reliant energy mix. While the VCEA's efficiency targets through 2025 are a useful – if modest – near-term framework, the absence of permanent, significant savings beyond 2025 will be inadequate to meaningfully offset Virginia's already-high and increasing rates and consumption.

By way of comparison, an analysis commissioned by NRDC[2] (also included as Appendix B) assumes Virginia achieves today's leading efficiency states' savings by the end of the decade. Those energy savings delivered over a third of the state's RGGI carbon reduction requirement by 2030, at a net compliance cost and average bill savings for those reductions.[3]

Based on those findings and any findings from a high-efficiency sensitivity, we therefore **recommend** Virginia Energy's report advise the General Assembly to enact a permanent EE standard that achieves by decade's end the savings achieved in leadership states today. (E.g. a 2% incremental savings standard by 2030.)

To provide a relevant energy efficiency baseline, NRDC also **recommends** a clear assessment of where Virginia stands on efficiency savings today through 2030, as compared to leading states and utilities.

Lastly, we **recommend** that Virginia Energy strongly consider advising the General Assembly to eliminate a significant barrier to delivering efficiency savings to Virginians: self-imposed efficiency investment ceilings at the SCC. Such budget caps on efficiency programs make harvesting all cost-effective energy savings impossible and raise the per-unit cost of any energy savings delivered by these budget limited programs. The result of such restrictive budget caps –

[2] Optimal Energy, "Policy Brief: The Impacts of a Virginia Energy Efficiency Resource Standard," 2020, available here.
[3] *Id.* at 12, 16.

in the case of Virginia's largest carbon emitter – is stark: 97 out of 100 electricity customers go unserved by a single utility-delivered efficiency program,[4] a remarkably high number of inefficient buildings already paying high rates and bills.

As our largest utility embarks on new, multi-decade construction spending (for the world's largest planned offshore windfarm; as much utility-scale solar in Virginia as currently exists in the entire state of California; and the largest energy storage commitment in the nation), concerted reform of Virginia's efficiency resources as outline above, will ensure the kind of least-cost compliance in which the General Assembly is interested.

III. Additional Recommendations

Lastly, we also offer two smaller observations and recommendations to consider, as Virginia Energy completes its modelling and report to the General Assembly.

1. We note that Virginia Energy's apparent finding that Virginia significantly over-complies (as an allowance exporter) in both 2027 and 2030 is in stark contrast to the more typical compliance pattern (emitting up to the cap).[5] Particularly given Virginia Energy's very modest efficiency assumption, we hope to better understand in the final report how Virginia might be a net allowance exporter (rather than importer).

2. It is NRDC's understanding that 2050 is the VCEA's zero carbon at-the-smokestack target, while 2045 is Dominion's separate REC-based target (that is, the year by which Dominion must purchase or produce, and retire, sufficient RECs to cover all non-nuclear load). To clarify these discrete but often conflated requirements, we also **suggest** that Virginia Energy provide for policymakers a clear distinction between the VCEA's REC-based RPS compliance requirements, and its at-the-smokestack carbon limits. This way, terms such as "100% clean," "zero-carbon," and "carbon-free" might hold more accurate meaning when policymakers describe the various elements of the VCEA.

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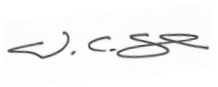
Thank you again for this opportunity, and for providing unique insight to policymakers.

Thank you,



Walton C. Shepherd

Enc.

[4] See Dominion Energy SCC Testimony, PUR-2020-00274, at 3, available here.

[5] That VCEA overcompliance is also contrary to NRDC's own IPM modelling; summary available here, at p 26.

Appendix A: NRDC Recommendations Summary

We recommend that the Virginia Energy Report:

1. Clearly elucidates what options are available for utility compliance with the VCEA's carbon-reduction requirements, and those compliance options' relative cost-effectiveness;

2. Provides policymakers with a clear baseline of rates and bills as they already exist in Virginia today, as compared to relevant vertically-integrated utilities in neighboring regulated states, and to peer utilities;

3. Include a sensitivity assuming Virginia adopts a robust energy efficiency standard that by 2030 achieves savings that equal those of today's leading efficiency states;

4. Advise the General Assembly to enact a permanent EE standard that achieves by decade's end the savings achieved in leadership states today;

5. Provide a clear baseline assessment of where Virginia stands on efficiency savings today through 2030, as compared to leading states and utilities; and

6. Advise the General Assembly to eliminate a significant barrier to delivering efficiency savings to Virginians: self-imposed efficiency investment ceilings at the SCC.

Appendix B: Analysis of a Virginia EERS

Optimal ENERGY *Integrated Energy Resources*

POLICY BRIEF:
The Impacts of a Virginia Energy Efficiency Resource Standard

January 2020

Prepared for

Natural Resources Defense Council

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INTRODUCTION

Almost every state in the U.S. implements significant utility-delivered energy efficiency programs that reduce the need to use or build more expensive power plants. Energy efficiency has real and important impacts: per capita electric use declined by 7 percent between 2010 and 2016, even as gross domestic product (GDP) increased.[1] Two-thirds of lower energy use per GDP unit is from energy efficiency, with the other one-third due to structural changes in the economy.[2]

Energy efficiency programs make it easier for electric customers to access updated technology – like lighting, heating or air conditioning upgrades, and insulation – that improves performance and reduces energy consumption in homes and businesses. Efficiency programs impact energy use across the entire economy, from residential homes and apartments, through small commercial buildings, big box stores, and office towers, school campuses, and manufacturing facilities. Efficiency programs improve nearly every energy system, including heating, cooling, insulation, lighting, plug-in appliances, and energy-intensive industrial processes.

Energy efficiency is not only an available resource across all sectors of the economy. It's a significantly less expensive resource than power generation to meet the economy's total need for electricity, while lowering, instead of increasing, total monthly electric bills. A survey of energy efficiency across 20 states found the average cost of saved energy via improved efficiency to be $28 per megawatt hour (MWh), or 2.8 cents per kilowatt hour.[3] This is significantly lower than the $42-$55 per MWh cost to provide electricity from Virginia's largest source of electricity, combined cycle gas turbines.[4]

The lower cost of increasing energy efficiency, compared to building new power plants, is particularly true in Virginia. Dominion Energy's (Dominion) most recent integrated resource plan (IRP) shows the cost of energy efficiency in the range of $5-$33 per MWh, compared to $68-$78 per MWh for electricity produced by gas turbines.[5]

Despite that economic advantage, Virginia's efficiency programs lag behind almost every U.S. state: Virginia achieves efficiency savings of only 0.05 percent of statewide electric sales per year, compared to a U.S. average of 0.73 percent. Virginia's efficiency savings is less than one-tenth the national average.[6] Indeed, Virginia is the fifth-lowest state when ranked for efficiency savings.

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[1] U. S. Energy Information Administration (EIA), 2017. "Per Capita Residential Electricity Sales in the U.S. Have Fallen since 2010." July 26. https://www.eia.gov/todayinenergy/detail.php?id=32212.

[2] U.S. Department of Energy (DOE), 2017. *Staff Report to the Secretary on Electricity Markets and Reliability*. August. Figure 3-30: Estimated U.S. energy savings from structural changes in the economy and energy efficiency, 1980-2016: 55. https://www.energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosgenerate&stream=politics.

[3] Molina, Maggie, 2014. "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs." Report Number U1402. March. Washington, DC: American Council for an Energy-Efficient Economy (ACEEE). Table S1: Summary of results for four-year averages (2009 – 2012) for all states in dataset: v. https://aceee.org/sites/default/files/publications/researchreports/u1402.pdf.

[4] EIA, 2019. "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the *Annual Energy Outlook 2019."* February. https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf.

[5] Dominion Energy, 2018. *Virginia Electric and Power Company's Report of Its Integrated Resource Plan*. Before the Virginia State Corporation Commission and North Carolina Utilities Commission; Public Version. Figure 5.5.4.3: Comparison of per MWh costs of selected generation resources: 96. https://www.dominionenergy.com/library/domcom/media/about-us/making-energy/2018-irp.pdf.

[6] ACEEE, 2019. The State Energy Efficiency Scorecard. https://aceee.org/state-policy/scorecard.

Meanwhile, 18 states achieve efficiency rates at levels 20-40 times greater than Virginia.[7]

This has a direct impact on Virginia's economy: Virginia's average electric bills are higher than they need to be. Over the last decade, Virginia electric rates have increased, significantly and repeatedly. Rates have increased for residential customers by almost one-third in the last decade,[8] with an increase of 71 percent for Appalachian Power (APCo) customers.[9] In 2018, only 6 states had higher average residential electric bills than Virginia's average monthly bill of $136.59. Further, Dominion plans significant bill increases in the near term, with increases of nearly $30 per month planned by 2023 for residential customers.[10,11]

In contrast, increasing energy efficiency in Virginia would provide needed relief to electric customers and also deliver low-cost carbon savings to meet the Commonwealth's 2030 carbon reduction requirement. Virginia utilities are not likely to do this on their own: energy efficiency reduces electric sales, and thus utility revenue, even despite ongoing annual overearnings.[12] Policy intervention is needed to ensure Virginians can easily access efficiency technology, to lower household costs and statewide carbon emissions.

A common means to ensure robust energy efficiency is legislative enactment of an energy efficiency resource standard (EERS), a requirement that utilities deliver minimum annual savings through efficiency program offerings to customers. Beginning with Texas, most states in the U.S. already have an EERS in place. Seven of those states make even deeper efficiency investments by requiring that utilities harvest all available cost-effective energy efficiency.[13]

State EERS adoption has worked: states with an EERS achieved energy savings of 1.2 percent of retail sales in 2017, a level four times above states that lack an EERS (0.3 percent of sales).[14] Several of Virginia's nearby mid-Atlantic states have substantial EERS goals in place, including Maryland (2 percent per year), Pennsylvania (0.8 percent per year), and New Jersey (requiring that all cost-effective energy efficiency savings be achieved, with a minimum of at least 2 percent per year within five years).[15]

Given steadily rising bills and increasing carbon emissions in Virginia, an EERS is an important tool for policymakers to consider. This report estimates the impacts that a Virginia EERS eventually requiring 2 percent savings per year would have on the Commonwealth's electric system, ratepayers, and the environment.

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[7] Id.

[8] EIA, n.d. "Electricity." Data tab. https://www.eia.gov/electricity/data.php.

[9] Commonwealth of Virginia, 2018. "Status Report: Implementation of the Virginia Electric Utility Regulation Act," In *Combined Reports*. Presented to the Governor of the Commonwealth of Virginia, the Chairman of the Senate Committee on Commerce and Labor, the Chairman of the House Committee on Commerce and Labor, and the Commission on Electric Utility Regulation of the Virginia General Assembly. Richmond: State Corporation Commission. August 29. https://www.scc.virginia.gov/comm/reports/2018_veurcomb.pdf.

[10] EIA, 2018. "Average Monthly Bill – Residential." Data from forms EIA-861, schedules 4A-D, EIA-861S and EIA-861U. https://www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.

[11] Walton, Robert, 2019. "Virginia Regulators Approve Revised Dominion IRP, but Warn about Understated Costs." *Utility Dive Brief,* June 28. https://www.utilitydive.com/news/virginia-regulators-approve-revised-dominion-irp-but-warn-about-understate/557853/.

[12] Many states address the issue of lost revenue by decoupling, so that utility earnings are not adversely affected by energy efficiency. See National Renewable Energy Laboratory (NREL), n.d. "Decoupling Policies: Options to Encourage Energy Efficiency Policies for Utilities." In *Clean Energy Policies in States and Communities*. https://www.nrel.gov/docs/fy10osti/46606.pdf.

[13] ACEEE, 2019. "State Energy Efficiency Resource Standards (EERS). " https://aceee.org/sites/default/files/state-eers-0519.pdf.

[14] Id.

[15] Id.

THE VIRGINIA CONTEXT: LOW EFFICIENCY SAVINGS, INCREASING BILLS

VIRGINIA'S EFFICIENCY SAVINGS ARE NEAR THE BOTTOM IN THE NATION

Virginia's current efficiency savings are extremely low compared to other states. In 2018, Virginia's utility efficiency programs achieved the fifth-lowest rate of electric savings in the nation, at only **0.05 percent of total electricity sold**.[16] Only four states have lower performance in efficiency savings (Alabama, Alaska, Kansas, and North Dakota). On average, efficiency savings across the U.S. are almost 15 times higher than what Virginia utilities achieve, and 18 states save more than 1.0 percent per year (20 times Virginia's savings rate). Thirty-two states achieve at least 10 times Virginia's rate. The appendix contains data for all jurisdictions with higher savings rates than Virginia.[17]

Dominion ranked 50th in efficiency, out of the 51 largest electric utilities in the country, in the American Council for an Energy Efficient Economy's (ACEEE) 2017 *Utility Energy Efficiency Scorecard*. Dominion earned low scores for its energy efficiency performance, its programs overall, and for the lack of stringency in its targets.[18] This low efficiency corresponds with Virginia's high electric bills.

VIRGINIA RATES AND BILLS HAVE STEADILY INCREASED AND WILL CONTINUE INCREASING

The value of increased energy efficiency is particularly relevant for Virginia customers, whose average electric bills have steadily increased and are now the seventh-highest in the nation.[19] In just the ten-year period from 2007 to 2016, residential electric bills increased significantly for both Dominion and APCo customers, with Dominion bills for a 1,000 kilowatt hours (kWh) per month residential consumer increasing 27 percent, and APCo bills increasing 74 percent.[20] Dominion proposes additional significant increases in the near term of nearly $30 per month.[21] Figure 1 shows past bill increases for both utilities, and a projection of Dominion's expected increases.

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[16] ACEEE 2019 State Energy Efficiency Scorecard. https://aceee.org/sites/default/files/publications/researchreports/u1908.pdf.

[17] See appendix to this report.

[18] Relf, Grace, Brendon Baatz, and Seth Nowak, 2017. "2017 Utility Energy Efficiency Scorecard." Report U1707, June. Washington, DC: ACEEE. This 2017 report is the latest available. https://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.

[19] EIA, 2018. "Average Monthly Bill – Residential." https://www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.

[20] Commonwealth of Virginia, 2018. "Status Report: Implementation." https://www.scc.virginia.gov/comm/reports/2018_veurcomb.pdf.

[21] Commonwealth of Virginia, 2019. State Corporation Commission, *Final Order in re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.* Case No. PUR-2018-00065: 5. http://www.scc.virginia.gov/docketsearch/DOCS/4hfb01!.PDF.

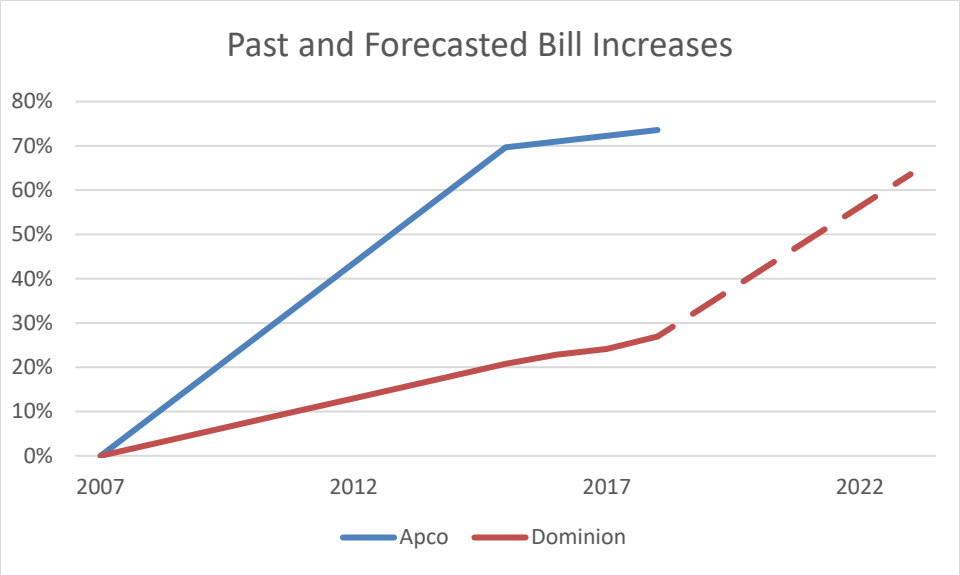

Figure 1. Increase in residential electric bill for customers using 1000 kWh per month.

The above figure highlights the importance of bills, as opposed to base rates. Despite the history of higher-than-inflation bill increases shown above, Virginia's underlying electric base rates are fairly typical in comparison to other states.[22] However, the average monthly residential bill (as opposed to the residential rate) is higher than the averages for all but six states, due to higher consumption. Some of that higher use is due to significant statewide use of electric heat (which itself presents a significant energy efficiency savings opportunity, discussed below). Much is also due to the lack of robust utility-driven efficiency programs that have offset the effects of similar rate increases in other states.

Efficiency deployment could have been a significant hedge against these increases. For example, a 2017 study from the Virginia Poverty Law Center found that 68 percent of this rate increase was from new generation and transmission costs – the kind of costs that can specifically be avoided through effective efficiency programs; 29 percent of the increase is due to higher fuel prices – a cost that would also be mitigated through efficiency.

It is critically important that Virginia strengthen efficiency to help residents offset rising electric costs, which Dominion plans to increase by over 20 percent by 2023.[23] These increases are largely driven by increases in fuel prices and Dominion's need to build more power plants or make transmission upgrades; all things that efficiency could have mitigated.

[22] EIA data show Virginia with a cost of $0.1174 per kWh, compared to a U.S.-wide cost of $0.1287. EIA, 2018. "Average Monthly Bill – Residential." https://www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.

[23] EIA data show Viriginia's average residential bill to be $136.59 per month. A $30 increases represents 20 percent. https://www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.

VIRGINIA UTILITIES NOT MEETING NON-BINDING GOALS

Virginia's attempt to increase energy efficiency via an optional goal has failed. In March of 2007, Virginia set a non-binding goal to reduce electric energy consumption of investor-owned utilities 10 percent by 2022.[24] If spread out over 16 years (2007-2022), this equates to an incremental annual goal of 0.625 percent. As of 2017, neither Dominion nor APCo have been close to achieving this goal for even a single year, as the figure below shows.[25]

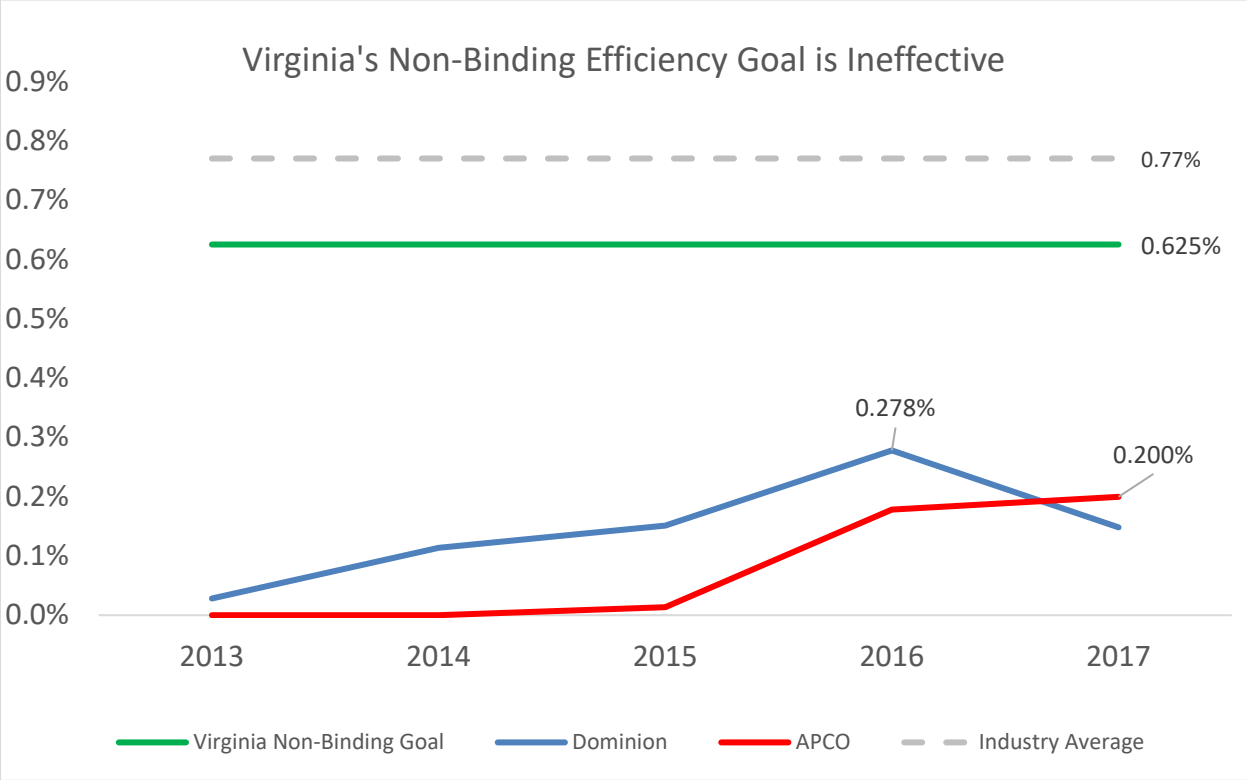

Figure 2. Savings as a percent of sales, Dominion and APCo, Virginia non-binding goal, and industry average, 2013-2017.

Non-binding targets have not proven effective at motivating utilities to deliver robust efficiency programs in Virginia, and Virginia's utility savings have in fact recently trended in the opposite direction. This suggests that a binding target is needed to ensure increased savings, lower bills, and decreased pollution.

[24] DOE, 2016. "Energy Efficiency Resource Goal." Raleigh: NC Clean Energy Technology Center, DSIRE. https://programs.dsireusa.org/system/program/detail/5056.

[25] Self-reported energy efficiency savings. https://www.eia.gov/electricity/data/eia861/.

VIRGINIA LAGS IN EFFICIENCY, DESPITE RECENT COMMITMENTS

The recently passed Grid Transformation and Security Act (GTSA) is an effective step to prioritize efficiency programs. Among other things, the legislation calls for Dominion and APCo to propose more efficiency programs, requiring that Dominion propose $870 million and APCo propose $140 million, in energy efficiency and demand response programs over the next decade.[26]

In response, Dominion has proposed and gained approval for 11 new energy efficiency and demand response programs at a cost of $225.8 million over a five-year period.[27] While a good first step at $45 million per year, investments will need to increase dramatically in later years to meet the legislative target. For reference, Dominion invested approximately $31 million on energy efficiency in 2015, or less than 0.5 percent of its revenue.[28] The average efficiency spending of other large utilities that same year was 2.7 percent of revenue.[29] While the new commitments represent a significant improvement from current efficiency investment, they fall well short of the average efficiency investment of U.S. utilities, and do not put Dominion on track to achieve the $870 million target. Even assuming Dominion will ramp up to reach the goals set by the GTSA, it is inadequate as 1) the legislation focuses on spending as opposed to delivering customer savings, and 2) that investment level is significantly below the achievable cost-effective potential, as shown by achievements in peer states.

The table below shows annual savings as a percent of sales projected for Dominion under the current commitment, as well as for both Dominion and APCo assuming the full GTSA commitment is made.

Table 1. Average annual efficiency savings as a percent of retail sales, projected, 2020-2023

	Annual savings as a percent of sales
Dominion savings - current commitment[30]	0.25%
Dominion savings - full GTSA[31]	0.86%
APCo savings - full GTSA[32]	0.79%
2015 large utility average[33]	0.89%

The above table shows the extent to which Virginia utilities continue to lag other large utilities in the U.S.: Dominion's GTSA commitment will yield less than one-third of the savings of the average large utility in 2015, and even under the full GTSA investment, savings for both utilities are still projected to be significantly lower than what typical large utilities have achieved.

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[26] Virginia General Assembly, 2018. "SB 966 Electric Utility Regulation; Grid Modernization, Energy Efficiency." Richmond: Virginia's Legislative Information System (LIS). https://lis.virginia.gov/cgi-bin/legp604.exe?181+sum+SB966.

[27] Commonwealth of Virginia, 2018. State Corporation Commission, Case No. PUR-2018-00168, *Order for Notice and Hearing*. http://www.scc.virginia.gov/case/e-notice/nr180168.pdf.

[28] Relf et al., 2017. "2017 Utility Energy Efficiency Scorecard." https://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.

[29] Id.

[30] Savings from Direct Testimony of Deanna R. Kesler. Case Number PUR-2018-00168. http://www.scc.virginia.gov/docketsearch/DOCS/4f%23q01!.PDF. Costs from Dominion IRP.

[31] Assumes that the cost per kWh under GTSA is the same as current commitments, and spending scales up from the approximate $25 million per year as shown in Kesler testimony to the $87 million per year required under GTSA.

[32] Assumes the same cost per MWh as Dominion's current commitment and $170 million in spending per year, as required by the GTSA.

[33] Relf et al., 2017. "2017 Utility Energy Efficiency Scorecard." https://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.

TWO PERCENT ENERGY EFFICIENCY RESOURCE STANDARD

An EERS similar to those implemented in 27 other states could elevate Virginia to a leadership position in energy efficiency, and offset the economic cost of recent and planned rate increases, while also making significant carbon reductions toward Virginia's 30 percent target in 2030.[34]

The rest of this report examines how a 2 percent EERS in Virginia might be implemented and its likely impact on Virginia's electric bills and carbon emissions, and shows some of the specific benefits that would result.

A 2 PERCENT EERS WILL AFFORDABLY ELIMINATE ELECTRIC LOAD GROWTH

Energy efficiency has significantly decreased America's per capita electricity consumption: America's per capita electric use decreased by 7 percent between 2010 and 2016.[35] That decrease occurred despite growth in both population and GDP, leading to a 3 percent decrease in total U.S. electric sales.[36]

Virginia is an exception to the national trend of decreasing electricity use: as seen in Figure 3 below, Virginia's electric sales have instead increased, and are forecasted by some to continue their steady increase over the next decade.[37] As described above, EERSs have helped successfully eliminate, and even reversed, electric load growth in other states.

This section examines an EERS in Virginia and provides estimates of how it might impact electric load and prices. To do so, both implementation costs and electricity savings were estimated for a Virginia EERS that would ramp up to 2 percent incremental annual savings in five years,[38] and then remain constant at 2 percent.[39] This savings rate has already been achieved in several states that are leaders in energy efficiency.[40] The EERS would apply only to Virginia's two largest investor-owned utilities, Dominion and APCo. We assume that savings will increase by 0.35 percent per year – a ramp-up rate that has been achieved in other states that have implemented strong EERS.[41] When Massachusetts ramped up savings to achieve all cost-effective efficiency, it steadily increased by about 0.35 percent per year from 1.3 percent savings in 2010, to 3.3 percent savings in 2016.[42] Rhode Island also went from achieving 1.3 percent savings in 2011 to 2.8 percent in 2015, an average increase of about 0.39 percent per year.[43] In addition, because Massachusetts and Rhode Island were already doing aggressive efficiency programs—and had

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[34] Virginia Department of Environmental Quality, 2019. "Virginia Adopts Regulation to Limit Carbon Pollution, Fight Climate Change," April 19. https://www.deq.virginia.gov/ConnectWithDEQ/NewsReleases/CarbonRule.aspx.

[35] EIA, 2017. "Per Capita Residential Electricity Sales." https://www.eia.gov/todayinenergy/detail.php?id=32212.

[36] Id.

[37] Forecast and history from Dominion and APCo integrated resource plans.

[38] The analysis assumes a start year of 2020. However, this could be shifted a year or two, depending on the timing of the legislation, and the resulting figures would be approximately the same.

[39] *Incremental annual savings* refers to the Year 1 impact of efficiency measures installed in that program year. *Total cumulative savings* represent the total reduction from all previous program years.

[40] ACEEE, 2019. "State Energy Efficiency Scorecard." https://aceee.org/research-report/u1908. Shows three states with greater than 2 percent savings in 2018.

[41] "Welcome to Mass Save Data," 2018. https://www.masssavedata.com/Public/SalesAndSavings.

[42] Id.

[43] Northeast Energy Efficiency Partnership. Regional Energy Efficiency Database. https://reed.neep.org/. Accessed November 2019.

been for years—that ramp-up was likely more ambitious because nominal percentage increases become progressively more difficult as goals increase. Virginia is starting from a much lower baseline than Massachusetts and Rhode Island; both of which had been national leaders in efficiency since the 1980s. Ramping up at these levels should be more readily achievable in Virginia, as ramping up becomes progressively more difficult as goals increase. As further evidence, a 2016 ACEEE study looked at ramp rates for 93 different program administrators. It found that 44 of the 93 ramp rates were higher than 0.2 percent, and that a full 20 percent were higher than 0.5 percent. This is further evidence that a 0.35 percent ramp rate should be highly achievable in Virginia.[44]

Virginia's high rate of building electrification, particularly in electric space heating (as discussed below), also provides significant savings opportunities that many other high-achieving states, including Massachusetts and Rhode Island, do not have. Potentially constraining that savings potential, however, are the effects of any opt-outs available for commercial customers. That is why efficiency programs under an EERS should include all customers. Alternatively, any opt-out should be accompanied by a requirement for self-directed energy efficiency, with required measurement and verification of results. Opt-outs are discussed in more detail below.

Under a 2 percent EERS, Virginians would see significant energy savings: Dominion and APCo would achieve a combined cumulative energy use reduction of 13,382 GWh by 2029. Put in perspective, that is approximately 14 percent of Virginia's electric retail load. The figure below shows recent Virginia electric use, with the consumption increases forecasted by Dominion and APCo through 2029, compared to the reduction in energy use a 2 percent EERS would deliver to Virginians.[45,46]

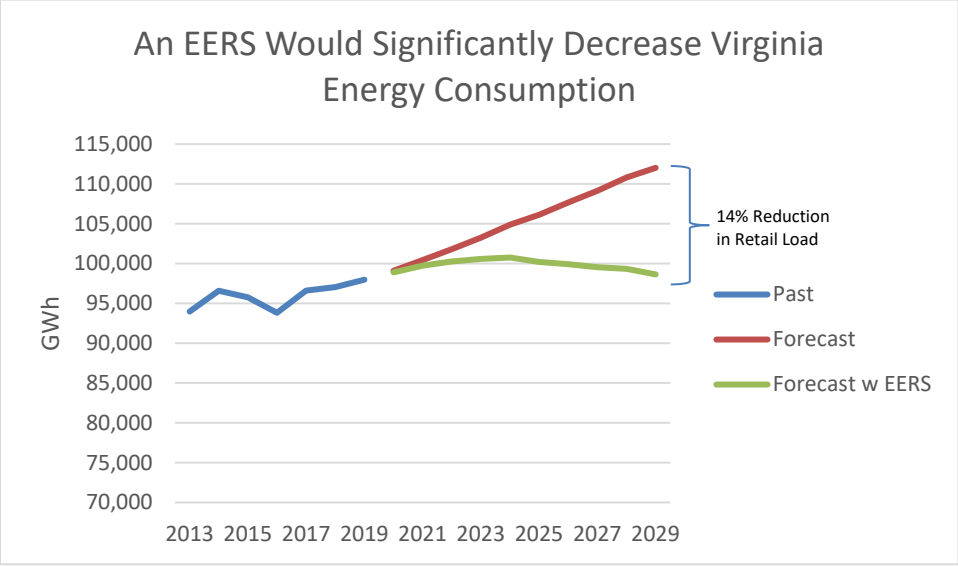

Figure 3. Virginia retail electric sales, with and without an EERS, 2013-2029.

[44] ACEEE, 2019. "Big Savers: Experiences and Recent History of Program Administrators Achieving High Levels of Electric Savings." https://aceee.org/research-report/u1601.

[45] Dominion Energy, 2018. *Integrated Resource Plan*. https://www.dominionenergy.com/library/domcom/media/about-us/making-energy/2018-irp.pdf.

[46] Appalachian Power Integrated Resource Plan. 2019.

As seen above, a 2 percent EERS would initially still result in some growth in energy consumption. However, once ramped up, an EERS would eliminate load growth and begin to reduce total consumption, through 2029, when total consumption would be near 2020 levels. The annual incremental savings Dominion and APCo would achieve using the assumed ramp-up rate discussed above are shown in the table below.

Table 2. Estimated incremental annual MWh savings with 2 percent EERS, Dominion and APCo, by sector, 2020-2025

	2020	2021	2022	2023	2024	2025
Residential	104,383	254,034	408,073	566,482	731,214	898,340
Low Income	8,351	20,323	32,646	45,319	58,497	71,867
C&I	96,032	233,711	375,427	521,163	672,717	826,473
Total	208,765	508,068	816,145	1,132,963	1,462,428	1,796,680

The assumed cost to deploy efficiency programs under a Virginia EERS relied on data on cost per unit saved from peer states and states that have high savings.[47] The table below shows those estimated costs, as well as spending as a percent of utility revenue represented. Large customers that are excluded from the efficiency programs make up a large portion of Virginia's commercial and industrial (C&I) load. Because efficiency is less expensive in C&I facilities, the total cost to achieve would decrease if the full base of C&I customers are included.

Table 3. Virginia estimated program costs with 2 percent EERS ($ millions), by sector, 2020-2025

	2020	2021	2022	2023	2024	2025
Residential	$24	$59	$95	$132	$170	$209
Low income	$6	$14	$23	$32	$42	$51
C&I	$23	$57	$91	$127	$164	$201
Total	$54	$131	$210	$291	$376	$462
Spending as percent of revenue	0.60%	1.47%	2.36%	3.28%	4.23%	5.20%

VIRGINIA SHOULD REMOVE ITS HIGHLY RESTRICTIVE LIMIT ON EFFICIENCY PARTICIPATION BY LARGER CUSTOMERS

To maximize EERS energy and bill savings, all customers should be included in utility program eligibility. However, under recently changed Virginia law, a very significant percentage of customers – those with demand above 500 kW – are automatically excluded from electric utility efficiency programs.[48] This is one of the most significant restrictions on efficiency potential in the country, and one that policymakers should strongly consider revising. (Prior to this significant

[47] We look at Illinois, Maine, Massachusetts, Pennsylvania, and Vermont, and have obtained cost data from their most recent annual reports.

[48] Code of Virginia. Section 56-585.1. https://law.lis.virginia.gov/vacode/title56/chapter23/section56-585.1/.

restriction on efficiency participation, which was included in 2018's GTSA, certain larger customers could voluntarily opt-out of programs, so long as they achieved energy efficiency savings on their own, a flexible option known as *self-direct*.)

The EERS has been modeled assuming that the current restriction on 500 kW+ customer participation remains. The 500 kW level results in exemption of a very large amount of Virginia's retail electric load, assumed to be approximately one-third of total retail load. This has the effect of turning a full statewide 2 percent EERS to a 3 percent EERS on the remaining eligible customers (total customer load less 500 kW+ customers). The remaining eligible load is two-thirds residential, a sector historically more expensive for efficiency programs to reach. Larger C&I customers typically participate in inordinately large numbers, and deliver a very high portion of savings at a lower cost than smaller C&I and residential customers.

We therefore recommend that the EERS remove the 500 kW+ restriction and include the entire electric customer base, with an option for larger customers that prefer to self-direct their own efficiency programs, with proper measurement, verification, and reporting of results. This will make the EERS savings target both more achievable and more cost-effective, as well as deliver greater benefits to all customers and the Virginia economy, including greater emissions reductions. If the 500kW+ exclusion remains in place as is, a significant amount of cost-effective potential in Virginia is excluded from participation. The residential sector will need to achieve nearly 3 percent of savings per year, in an environment when lighting savings are mostly no longer available. Small C&I will likely need to achieve over 3 percent savings, another feat that would be very difficult to achieve. If the current opt-out policy is not updated, the savings goals estimated in this paper will become very difficult to achieve, and will likely have to be modified.

THE INVESTMENT REQUIRED TO MEET A VIRGINIA EERS IS SIMILAR TO OTHER STATES

Meeting the EERS requires significant increases in efficiency investment, just as the alternative of meeting increasing energy demand requires significant—and actually larger – investment in power plants, transmission, and distribution system upgrades. Annual efficiency program costs under an EERS would reach $462 million by 2026, or half of the utilities' total 10-year spending target from the GTSA. This level of spending represents about 5.2 percent of total utility revenue, putting Dominion and APCo in line with Ameren Illinois, Baltimore Gas and Electric, Com Ed, Eversource Connecticut, MidAmerican Iowa, Portland General Electric, and Puget Sound Energy, each of which spends between 4 and 6 percent of revenue on efficiency.[49] For comparison, the large utilities in Massachusetts, the nation's leading state in energy efficiency savings, invest more than 10 percent of revenue on energy efficiency.[50] By design, the investment delivers bill savings that are greater than efficiency investment costs, resulting in lower customer bills, as well as significant decreases in power plant pollution.

[49] Relf et al., 2017. "2017 Utility Energy Efficiency Scorecard." https://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.
[50] Id.

A 2 PERCENT EERS WILL LOWER VIRGINIANS' ELECTRIC BILLS

An EERS will pay for itself with bill savings from efficiency programs that are greater than efficiency program costs. Those program costs would be covered through a rate adjustment clause (RAC), a small per kWh surcharge used to fund investments and costs additional to the base rate. The analysis below demonstrates how an EERS RAC would be offset by a decrease in the total bills, due to the lower usage, which would result in average bill reductions for Virginians.

The table below shows the RAC increase needed to fund a 2 percent EERS,[51] assuming that, similar to supply side investments, program costs are amortized over the average measure life of the installed technology of 10 years, and that the utilities will also earn a return on the program investment of 9.2 percent.

Table 4. Estimated rate increase ($ and %) and average bill effect (%) from a 2 percent EERS, 2020-2029, amortized

		2020	2021	2022	2025	2029
Per kWh increase	Res	$0.0001	$0.0005	$0.001	$0.004	$0.010
	C&I	$0.0002	$0.001	$0.001	$0.005	$0.013
Rate effect	Res	0.1%	0.5%	1.0%	4.0%	9.9%
	C&I	0.2%	0.8%	1.8%	7.2%	17.9%
Average bill effect[52]	Res	-0.2%	-0.7%	-1.4%	-5.4%	-11.7%
	C&I	-0.3%	-0.9%	-1.8%	-6.5%	-13.7%

As the table shows, total customer rate impacts would be negligible in the early years, increasing to one-tenth of a cent in year three. For a residential customer using 1,000 kWh per month, this equates to approximately $1.00 per month to pay for efficiency programs. By year 5, with a significant expansion of deployed efficiency programs, the total cost impact via RACs increases to approximately half a cent per kWh, or $5 per month.

That increase, due to the cost of deploying significant efficiency programs, however, would be more than offset by a decrease in total bills, as customers increase efficiency. The figure below shows the change in projected total bills (in all sectors) for APCo and Dominion customers from 2019 to 2029 under a scenario with no EERS and one with an EERS.[53] Due to load growth, bills

[51] We do not include lost revenue recovery because 1) it is not a cost of efficiency, per se; these costs might include fixed costs that would be covered, regardless; 2) there are many different ways to handle lost revenue recovery, including RACs, rate cases, and decoupling; and 3) lost revenue recovery is not currently included in Dominion's planned programs.

[52] This shows the average bill impact, including both participants and non-participants. While the bill impact for participants only will be highly variable depending on sector, specific efficiency program, and number of times participated, typical savings for participants may approach 20% for residential customers and 27% for C&I customers.

[53] This is high-level analysis isolating the direct impact of efficiency programs. A complete analysis would look at lost revenue requirements, impact on supply side generation, reduction in transmission and distribution (T&D) expenditures, price effects from lower demand, and more. Further, the baseline case assumes a constant $ / kWh from today's level, whereas the EERS case uses the baseline rate plus the additional rate from recovery of the efficiency programs. Neither scenario includes the proposed rate increase that Dominion has proposed; including that scenario would likely increase the bill savings from the EERS.

initially increase slightly in the short term. However, under an EERS, total bills decrease by 12 percent below what they would be in 2029.

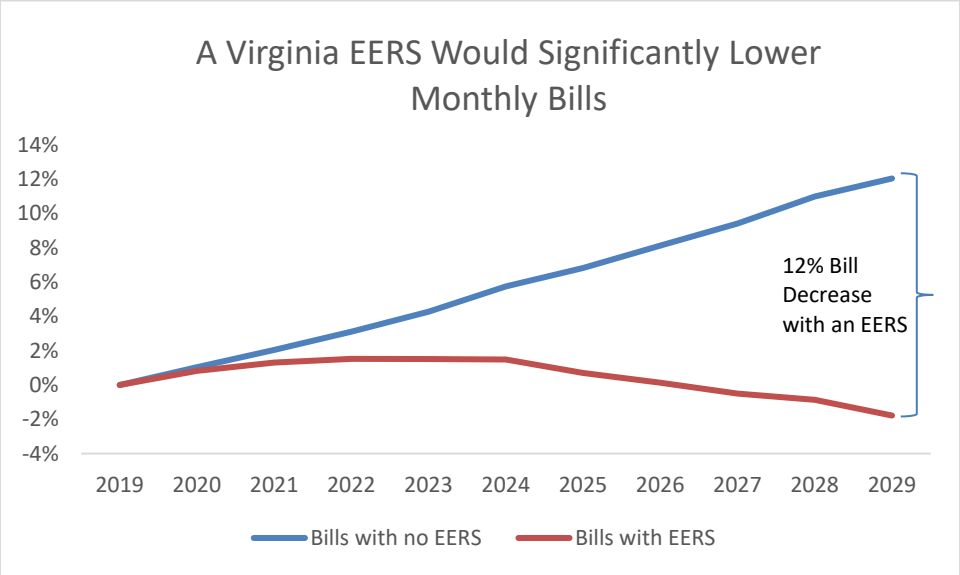

Figure 4. Change in total residential, commercial, and industrial electric bills, with and without EERS, 2019-2029.

The above figure reflects efficiency's downward impact of 12 percent on total monthly electric bills. Any increase in RAC costs for individual households is outweighed by even minimal participation in available efficiency programs, as is reflected in other states. As one example, the average residential participant in Vermont's 2018 lighting upgrade program alone saved 43 kWh per month.[54] Assuming a Virginia LED lighting upgrade program achieves similar savings and the LED upgrade is in place for 15 years, the participant will save a total of $840 over its life. Indeed, the primary purpose of efficiency programs is delivering those lower net costs over the life of the technology deployed.

Many states with high efficiency savings yield similar cost-saving results, when utilities make efficiency programs widely available and effectively marketed. A Massachusetts study found an average total residential bill reduction of $2 per month with near universal participation – even despite the state's long-term average rate increase of 2.1 percent.[55] A study in Vermont found that three years of efficiency programs lowered participant bills by up to 24 percent, depending on the program.[56] The same analysis found that, over time, nearly every eligible ratepayer had participated in an efficiency program. A Rhode Island analysis found bill reductions of 1.67

[54] Efficiency Vermont, 2019. *Efficiency Vermont 2018 Savings Claim Summary*. Burlington, VT: VEIC: 53. https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2018/2018-savings-claim-summary.pdf. Derived from Table 3.17.

[55] Woolf, Tim, 2013. "Energy Efficiency: Rate, Bill and Participation Impacts." Presentation at *Energy Efficiency as a Resource* Conference. September 24. Washington, DC: ACEEE. https://aceee.org/files/pdf/conferences/eer/2013/5C-Woolf.pdf.

[56] Woolf, Tim, Erin Malone, and Jenn Kallay, 2014. "Rate and Bill Impacts of Vermont Energy Efficiency Programs: From Proposed Long-term Energy Efficiency Scenarios 2014 – 2034." Montpelier, VT: Vermont Public Service Department, April 23. https://www.synapse-energy.com/sites/default/files/SynapseReport.2014-04.VT-PSD.VT-EE-Bill-Impacts.13-088.pdf.

percent (net of the rate increase) for residential participants, and bill reductions of up to 23 percent for C&I participants, depending on the program.[57]

Given these delivered benefits of efficiency in successful programs, the best way to avoid net upward rate impacts on monthly bills is not to restrict program budgets, which limits the accessibility of the program benefits to a smaller subset of the population, and therefore reduces net bill savings. Indeed, such limitations on available efficiency programs create significant inequities in who can and cannot access energy efficiency savings. Instead, the best approach to ensure net bill savings for the most customers is to design and implement a suite of comprehensive programs that allow and encourage every segment of each customer class to participate. Studies in states with long histories of robust efficiency show near universal participation in efficiency programs is achievable, which in turn outweighs rate increases needed to fund those successful programs.[58]

A 2 PERCENT EERS WILL LOWER LONG-TERM RATES

Virginians pay not only base rates, but also a variety of RACs to cover an array of past and ongoing investment to meet total energy system needs. Efficiency programs must be paid for as well and are therefore no different. However, even when including the small increase in customer RAC costs to cover upfront efficiency implementation, energy efficiency is the least-cost resource when compared to other RAC and base rate expenses. Thus, efficiency lowers total rates in the long term, when compared to alternate investment in increasing new generation or shoring up transmission and distribution. The figure below is from Dominion's IRP and shows the cost of its energy efficiency programs compared to supply-side options.

[57] National Grid, n.d. "2019 Bill Impacts." http://rieermc.ri.gov/wp-content/uploads/2018/09/2019-eepp-attachment-7-bill-impact-analysis-final-draft.pdf.

[58] Tim Woolf et al. 2014. "Rate and Bill Impacts." https://www.synapse-energy.com/sites/default/files/SynapseReport.2014-04.VT-PSD.VT-EE-Bill-Impacts.13-088.pdf.

Figure 5.5.4.3 – Comparison of per MWh Costs of Selected Generation Resources

Comparison of per MWh Costs of Selected Generation Resources to Phase II through Phase VI Programs	
Utility Cost Perspective	Cost ($/MWh)
Non-Residential Heating and Cooling Efficiency Program	$5.47
Residential Retail LED Lighting Program (NC Only)	$14.70
Non-Residential Lighting Systems and Controls Program	$14.72
Non-Residential Window Film Program	$19.79
Non-Residential Prescriptive Program	$33.12
Solar	$56.38
Small Business Improvement Program	$56.51
2X1 CC	$67.72
1X1 CC	$78.44
Onshore Wind	$94.10
CT	$107.05
Offshore Wind	$130.60
Nuclear	$141.52
Aero CT	$171.54
Fuel Cell	$199.25
Biomass	$221.08
Income and Age Qualifying Home Improvement Program	$237.17
Solar & Aero CT	$248.73
SCPC w/ CCS	$309.93
IGCC w/ CCS	$444.91
CVOW	$779.71

Figure 5. Comparison of per MWh Costs of Selected Generation Resources.

Even the cheapest supply side option, solar, at $56.38 per MWh, is still nearly 50 percent higher than that of the most expensive energy efficiency option. The lowest-cost dispatchable resource – the gas combined cycle plant, costing between $67.72 per MWh and $78.44 per MWh – is 2 to 10 times the price of the costliest energy efficiency option. Virginia's over-emphasis on costlier generation spending is notable: in the past decade alone, Dominion has invested ratepayer dollars in at least 10 supply-side power plants that total nearly 6 GW of capacity, at a cost to Virginia customers of over $6 billion.[59] Over the medium to long term, increased energy efficiency could have supplanted the need for even more expensive supply-side builds that Virginia has invested in so heavily, and led instead to lower overall revenue requirements for Virginia utilities.

Energy efficiency also delivers other benefits to all ratepayers, both participants and non-participants. Efficiency reduces peak demand, decreasing the dispatch of high-cost (and higher polluting) marginal generators, which also lowers the market clearing cost for electricity. While the specific benefits of this effect can vary widely by location, Massachusetts has saved upwards of $700 million from these price suppression effects.[60]

Energy efficiency also reduces the need for expensive upgrades to an overstressed transmission and distribution system. While these costs are also highly location-specific, energy efficiency programs in Massachusetts have saved $423 million in avoided transmission and

[59] The plant investments include Altavista, Bear Garden, Bremo, Brunswick, Greensville, Hopewell, North Anna 3, Southampton, Warren, and VCHEC.

[60] Tim Woolf, 2013. "Energy Efficiency: Rate, Bill and Participation Impacts." https://aceee.org/files/pdf/conferences/eer/2013/5C-Woolf.pdf.

distribution costs.[61] In addition to bill savings, these are the larger system cost savings that Virginia has left untapped, and which an EERS would help deliver.

A 2 PERCENT EERS WILL SIGNIFICANTLY CONTRIBUTE TO VIRGINIA'S CARBON GOALS

Efficiency savings also directly reduce upstream power plant pollution, making an EERS a useful tool for Virginia's own environmental and climate change goals. To address climate change, Virginia requires a 30 percent reduction by 2030 in the carbon pollution from in-state power plants: our analysis suggests an EERS could deliver 35 percent of that target.

In April 2019, the Virginia State Air Pollution Control Board finalized a regulation that requires large fossil-fuel electric power plants to annually reduce CO_2 emissions.[62] The regulation puts an initial 28-million ton cap on total CO_2 emissions from large plants, and mandates a reduction of 30 percent by 2030. A 2 percent EERS is a low-cost, proven way to make strong progress toward this significant statewide emission reduction. This section shows how an EERS would likely impact carbon emissions in the Commonwealth.

Virginia's 2030 carbon limit will be applied to an inefficient electric system, with rising consumption and its associated carbon pollution. The final regulation sets an initial 2020 carbon emissions cap of 28 million tons for large in-state generators (compared to expected emissions of 28.02 million tons).[63] The electric load is expected to increase over the next decade which, in the base case, will further increase emissions.[64] In order to isolate the impacts of the EERS, this analysis assumes that the Virginia emissions rates will remain constant over the period in question (i.e., that emissions will not change from differences in generation mix, in addition to the lower overall energy usage as a result of the EERS).

As shown in Figure 3 above, a 2 percent EERS will eliminate and then reduce electric load growth, thus reducing the associated upstream carbon emissions. In addition, energy efficiency reduces the use of marginal, highest-cost generators, which tend to be the most carbon intensive form of electricity production, typically older and less efficient coal and oil units. Modeling by Natural Resources Defense Council (NRDC), conducted by ICF, projected that the CO_2 emissions intensity of Virginia grid energy would be around 0.29 tons per MWh. However, in electricity generation, the low- and no-carbon sources tend to be used as baseload, with the higher carbon sources used at the margin. Since energy efficiency lowers emissions at the margin, the impacted electricity has a higher emissions factor than the average electricity - estimated at 0.42 tons per MWh by Bloomberg New Energy Finance (BNEF).[65] This means that a 2 percent EERS will actually result in greater than 2 percent annual incremental reductions in carbon emissions.

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[61] Id.

[62] Virginia Department of Environmental Quality, 2019. "Virginia Adopts Regulation to Limit Carbon Pollution, Fight Climate Change," April 19. https://www.deq.virginia.gov/ConnectWithDEQ/NewsReleases/CarbonRule.aspx.

[63] NRDC Modeling of a Virginia Base Case, conducted on behalf of NRDC by ICF using their Integrated Planning Model (IPM) modeling for 2020. March 2018.

[64] Increase in electric load is based on data in the Dominion and APCo IRPs.

[65] Bloomberg New Energy Finance, 2019. US Power and Fuel Prices.

A 2 percent EERS can achieve a significant portion of Virginia's carbon target by directly reducing upstream smokestack carbon emissions. Figure 4 shows carbon emissions from Virginia electricity generation in the baseline case of no efficiency, compared to a 2 percent EERS. The baseline case uses a constant 2020 average emissions factor and projects load growth based on the Dominion and APCo IRP forecasts. The efficient case uses the BNEF 2020 estimate for the marginal emissions rate applied to the savings from the 2 percent EERS. We assume, conservatively, that energy efficiency will reduce electric imports to Virginia in proportion to the total imports. In other words, since about 20 percent of Virginia sales are from out-of-state power imports, we assume that only 80 percent of the total efficiency savings from the EERS will go towards reducing in-state emissions from utility scale generators.[66] The figure below also shows Virginia's declining carbon limit.

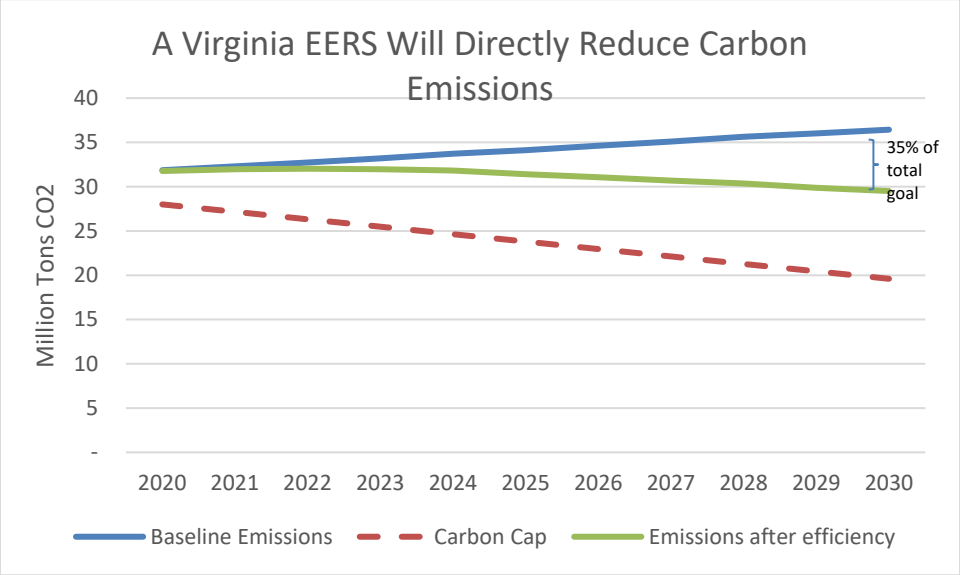

Figure 6. Projected CO2 reductions from 2 percent EERS compared to the baseline forecast and the statewide carbon budget.

Compared to an increase in emissions of 11 percent in the base case with no EERS, emissions under an EERS would fall by 4 percent. An EERS would therefore achieve 35 percent of the 2030 carbon reduction goal, when compared to a base case of rising electric consumption and rising emissions. This carbon reduction is to be expected. Studies evaluating economy-wide decarbonization regularly point to energy efficiency as the most cost-effective approach to achieving meaningful greenhouse gas emissions reductions.[67] In fact, while many emissions reductions strategies, like increased renewable deployment, come at a net cost, energy efficiency is shown to instead deliver significant net savings. For this reason, energy efficiency should be Virginia's first strategy deployed to reduce carbon emissions in the near and long term.

[66] EIA data show approximately 22 percent of Virginia electricity from imports and combined heat and power (CHP). EIA, 2019. "Virginia Electricity Profile 2017," in *State Electricity Profiles*. https://www.eia.gov/electricity/state/Virginia/.

[67] McKinsey & Co., n.d. "Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve." https://www.cbd.int/financial/doc/Pathwaystoalowcarboneconomy.pdf.

HIGH LEVELS OF ELECTRIC HEATING GIVE VIRGINIA A SPECIAL EFFICIENCY OPPORTUNITY

Virginia is better positioned than most jurisdictions to pursue energy efficiency savings via an EERS in the residential sector: Virginia households are highly electrified (i.e., higher levels of electric heat and hot water, as opposed to use of natural gas or fuel oil). Those electrified end uses provide more opportunities for significant electric efficiency programs and savings than in many other states.

This is particularly true for Virginia's residential home heating. A full 55 percent of Virginia homes use electricity as the primary heat source, and about 60 percent of those homes use electric resistance heating.[68,69] Electric resistance heating is notoriously wasteful, inefficient, and obsolete. Converting to air source heat pumps, a common and well-established technology, could reduce heating costs by more than 60 percent.[70] The savings are not limited to heating. Air source heat pumps provide cooling in the summer as well, and are typically more efficient than central air conditioners. Therefore, air source heat pump conversions deliver additional cooling savings and peak demand reductions as well.

According to the Mid-Atlantic Technical Reference Manual (TRM), a typical 2-ton electric resistance heating system in Virginia will use 6,600 kWh in the heating season. Converting to a heat pump reduces this to 2,700 kWh, a savings of 3,900 kWh. This represents under a 3.5-year simple payback on the full cost for a new heat pump for a customer, even before any utility efficiency program incentives or cooling savings are included.[71]

If just half of the Virginia households with electric resistance heat converted to heat pumps under a utility efficiency program, Virginia's total residential load alone would decrease by almost 4 percent.[72]A similar analysis applies to converting inefficient electric resistance water heaters to heat pump water heaters, which can use 60 – 70 percent less electricity.

In both cases, Virginia's high saturation of electric heating equipment (as opposed to gas and oil) gives Virginia a large, highly cost-effective opportunity for savings.

We recommend that part of the energy efficiency portfolio for Dominion and APCo under an EERS include programs that aggressively promote replacement of highly inefficient and costly electric resistance heat with air source heat pumps, as well as heat pump water heater upgrades.

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[68] EIA, 2009. "Household Energy Use in Virginia." https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/VA.pdf.

[69] EIA, 2016. "2015 RECS Survey Data," in *Residential Energy Consumption Survey (RECS)*: Table HC6.8: Space Heating in the South and West Regions. https://www.eia.gov/consumption/residential/data/2015/hc/php/hc6.8.php.

[70] For Virginia-specific assumptions from EIA data, see NEEP, 2018. "Mid-Atlantic Technical Reference Manual, Version 8," May. Lexington, Mass.: Northeast Energy Efficiency Partnerships. https://neep.org/sites/default/files/resources/Mid_Atlantic_TRM_V8_0.pdf.

[71] Costs and Full Load Hours from Mid-Atlantic TRM. See NEEP, 2018. "Mid-Atlantic Technical Reference Manual, Version 8," May. Lexington, Mass.: Northeast Energy Efficiency Partnerships. https://neep.org/sites/default/files/resources/Mid_Atlantic_TRM_V8_0.pdf.

[72] Calculated as 55 percent of homes with electricity as their primary heat source, times 60 percent of these homes using electric resistance, times 32 percent space heating as percent of total electric use (RECS), times 70 percent savings from heat pumps, times 50 percent penetration.

TWO PERCENT SAVINGS WILL REQUIRE STRONG PROGRAM DESIGN

Achieving 2 percent savings will require well-designed programs operating in every market. Dominion's recently approved phase VII DSM plan contains 11 programs:

- Residential Appliance Recycling Program
- Residential Customer Engagement Program
- Residential Efficient Products Marketplace Program
- Residential Home Energy Assessment Program
- Residential Smart Thermostat Management Program – Energy Efficiency
- Residential Smart Thermostat Management Program – Demand Response
- Non-Residential Lighting System & Controls Program
- Non-Residential Heating and Cooling Efficiency Program
- Non-Residential Window Film Program
- Non-Residential Small Manufacturing Program
- Non-Residential Office Program

This section identifies several additional areas that would significantly improve and expand Dominion's efficiency portfolio to facilitate achievement of a 2 percent EERS.

- **Residential and Non-Residential New Construction –** The incremental cost of new construction efficiency measures tends to be lower than when retrofitting existing buildings. If savings are not captured at construction, it will be decades before some of the building systems are replaced. Successful utility programs targeting new construction typically use a multi-pronged approach to ensure architects, engineers, and developers integrate efficiency throughout the design and build process.

- **Low-Income Program –** The Commonwealth has recognized the vulnerability of low-income people to the state's rising electric costs. Virginia's Grid Modernization and Security Act requires that at least 5 percent of energy efficiency programs benefit low-income, elderly, or disabled people. To achieve this goal, it is likely necessary to design a program that specifically meets the needs of the low-income sector and that pays 100 percent of the cost of efficiency. We also recommend that the 5 percent level be substantially increased in any new legislation.

- **LED Streetlighting – High-efficiency** LED streetlights are sometimes more difficult to install via traditional programs, as they are often owned and operated by the utility or local governments. However, LED streetlights are an extremely cost-effective measure with potentially large financial savings, given their high numbers and constant use. Efficiency programs in other jurisdictions have addressed utility or locality-owned streetlights in ways that solve stranded asset concerns and ensure the utilities' best interest to pursue the most cost-effective street lighting solutions.

- **Residential and Non-Residential Upstream** - Upstream programs – where the incentive is given to the manufacturer, distributor, or retailer and automatically applied at purchase – significantly increase program participation and savings by working directly with manufacturers, distributors, and retailers to promote high efficiency equipment, including providing incentives to upstream manufacturers and distributors rather than to end users. The end-user customers do not need to file paperwork or otherwise actively enroll in a program; they just see a discounted product on the store shelf and may not even realize that they have just participated in an efficiency program. Further, since retail markups are usually based on a percentage of wholesale prices, by lowering the wholesale price of the product upstream, incentives can leverage lower program costs to reduce retail prices. Upstream market players are often best situated to promote efficient products to their customers and are necessarily involved at the appropriate time for installations, such as replacements at the time of equipment failure. Recent efforts in California, Massachusetts, and New Brunswick to move standard rebates for lighting and heating and cooling measures completely upstream (with distributors providing an incentive based on wholesale incremental cost for each unit sold) have been very successful.

- **Non-Residential Custom –** C&I customers have much more variation in size, load, and energy needs than residential customers. As a result, they often have custom needs that are difficult to address through simple prescriptive rebates. Successful commercial custom programs with high customer participation include important enhancements and complementary services focused on providing greater customer service and sometimes detailed technical assistance. Best-practice C&I custom programs include:
    - Active account management for medium and large customers
    - At the customer's request, the provision of tiered energy services starting with on-premise walk-through energy audits (ASHRAE tier I) at no or low cost
    - Assistance with streamlined delivery, including a single point of contact or bundled efficiency measures (retro-commissioning, building operator training, common area lighting, audits) for large buildings
    - Provision of detailed technical assistance and feasibility studies (ASHRAE tier II). Many utilities offer these services with an initial customer contribution of 50 percent of the cost. If the customer follows through with implementation of the resulting recommendations, this contribution is waived and the program covers 100 percent of the study. This strategy has been quite effective. Requiring an initial financial commitment reduces the number of customers who are not serious are about making efficiency investments; forgiving that cost creates a strong incentive for customers to implement identified measures
    - Turnkey project management that includes energy efficiency project identification; scoping and documentation services, such as assistance in filling out program materials; engaging with design professionals and contractors;

and generally helping to coordinate the participation and implementation process

- Maintaining a group of expert process engineers in various industrial processes. These can be referred to industrial clients to examine their industrial process energy usage for efficiency improvements. There are often many low / no cost process measures that can significantly reduce process-related energy use and cost

- **Non-Residential Small Business Direct Install** – This program is commonly offered as part of a full efficiency portfolio, to address specific barriers that make it hard for small businesses to participate. Small Business Direct Install programs typically offer a free energy assessment that recommends changes in lighting and other simple measures. The customer can choose which identified measures to implement, and the program pays a significant portion of the upfront cost, typically 50-75 percent. The turnkey program makes participation as easy as possible

PERFORMANCE INCENTIVES BETTER ALIGN UTILITY INCENTIVES TO PROMOTE EFFICIENCY

While efficiency program costs are recovered in Virginia through RACs, the fact that the utility earns a rate of return on larger investments in more expensive power plant options means utilities are more motivated to invest in generation than in efficiency. To equalize demand-side and supply-side resources, many states include performance incentives that provide extra financial benefits when efficiency programs meet certain goals. Currently, twenty-nine states have performance incentives. The exact form and conditions for performance incentives vary widely, but they are often in the range of 5-10 percent of program spending.[73] Performance incentives can be very successful at encouraging utilities to make energy efficiency a priority, as well as proposing higher savings targets.[74] A Virginia EERS should include such incentives.

[73] ACEEE, 2018. "Snapshot of Energy Efficiency Performance Incentives for Electric Utilities." Topic Brief, December. Washington, DC: ACEEE. https://aceee.org/sites/default/files/pims-121118.pdf.

[74] ACEEE, 2018. "Snapshot." https://aceee.org/sites/default/files/pims-121118.pdf.

CONCLUSION

In recent years, Virginia has seen significant increases in electric bills and rates (particularly RACs), with more increases expected. At the same time, energy efficiency – Virginia's lowest cost energy resource – is significantly underutilized. In 2017, only five states had lower efficiency savings than Virginia, and Virginia is projected to remain in the lowest quintile of states, even with its planned expansion of energy efficiency under the GTSA.

The current nonbinding targets set in 2007 have not delivered additional efficiency. Over a decade later, neither of Virginia's largest utilities are in range of meeting the targets, and Dominion will still be saving less than 50 percent of the target, even after its planned efficiency program expansion.

Clearly, a new approach is needed to provide Virginia ratepayers the full benefits of energy efficiency and relief from rising electric costs. The EERS is a tried and tested approach. Since Texas implemented the first EERS over two decades ago, 27 states have implemented them. EERSs have been highly successful: states with an EERS have average energy efficiency savings of 1.3 percent per year, compared to only 0.3 percent for states with no EERS.

Energy efficiency necessarily causes a short-term increase in RAC costs, as does any investment, but in the long-term, efficiency will lower the total cost of rates and RACs, as the need for more expensive supply-side investments is displaced. More immediately, efficiency delivers short-term reductions in average electric bills, as total energy usage is lowered beyond the cost of efficiency measures. While non-participants may see bill increases, this can be addressed by more comprehensive energy efficiency investment and better outreach and marketing to all customer segments. Under the 2 percent EERS proposed in this brief, efficiency programs would be broad enough to give every Virginia ratepayer multiple avenues to participate and lower bills.

A 2 percent EERS would also achieve over a third – 35 percent – of the carbon reductions necessary to meet Virginia's 2030 carbon reduction requirement. Further analysis would also quantify the significant additional benefits of mitigating fuel price increases, improving indoor and outdoor air quality across the Commonwealth, and increased local economic activity, both from bill savings and increased employment.

APPENDIX

ELECTRICITY SAVINGS BY STATE, 2018

The table below shows the most recent annual electricity savings as a percent of load for all jurisdictions with higher savings rates than Virginia.

Table 5. ACEEE 2018 net incremental electricity savings by state

State	EE savings as a percent of statewide load	State	EE savings as a percent of statewide load
Massachusetts	2.82%	Utah	0.70%
Rhode Island	2.79%	Arkansas	0.68%
Vermont†	2.30%	North Carolina	0.67%
Maryland	1.87%	Missouri	0.61%
Illinois	1.66%	Nevada†	0.59%
California†	1.62%	New Mexico	0.56%
Hawaii†*	1.47%	Indiana†	0.55%
Michigan	1.46%	Montana†	0.51%
Connecticut	1.37%	Oklahoma	0.50%
Minnesota†	1.33%	South Carolina†*	0.49%
Arizona†1	1.27%	New Jersey†	0.35%
District of Columbia	1.23%	Mississippi	0.28%
Washington†	1.18%	Nebraska†3	0.26%
New York†	1.16%	Georgia†	0.25%
Ohio†	1.14%	Wyoming†	0.24%
Iowa†2	1.08%	South Dakota†	0.20%
Colorado	1.07%	West Virginia	0.19%
Maine†	1.05%	Texas†	0.18%
Oregon†	0.95%	Delaware	0.15%
Idaho†	0.87%	Tennessee†	0.13%
New Hampshire†	0.75%	Kentucky†	0.12%
Pennsylvania†	0.74%	Florida†	0.09%
Wisconsin	0.72%	Louisiana†	0.05%
		Virginia	**0.05%**

ESTIMATING THE RAMP-UP PERIOD NECESSARY FOR 2 PERCENT EERS

To determine the ramp-up of costs and savings associated with a 2 percent EERS in Virginia, we looked at recent energy efficiency savings achieved by APCo and Dominion. We relied on recent evaluation results from both service territories to understand their positions. Evaluated results for 2013-2017 were filed as part of Dominion's 2017 DSM filing; APCo filed evaluated results for program year 2016 in its 2017 DSM filing. To calculate historic and projected savings

as a percent of sales, we used load forecasts from APCo and Dominion's most recently filed IRPs. We removed sales of opt-out customers from the sales forecast, assuming the same load percentage as calculated from Dominion's 2017 DSM filing. We note, however, that most states that allow large customers to opt-out of efficiency programs still require these customers to spend what they otherwise would have paid for the efficiency surcharge on cost-effective energy improvements in their own facilities.

Because the utilities' levels of savings are significantly lower than the 2 percent savings proposed as an EERS, a ramp-up period will likely be needed to reach that level of savings. We assumed a ramp-up period of approximately 0.35 percent per year for the utilities to reach 2 percent savings by 2025.

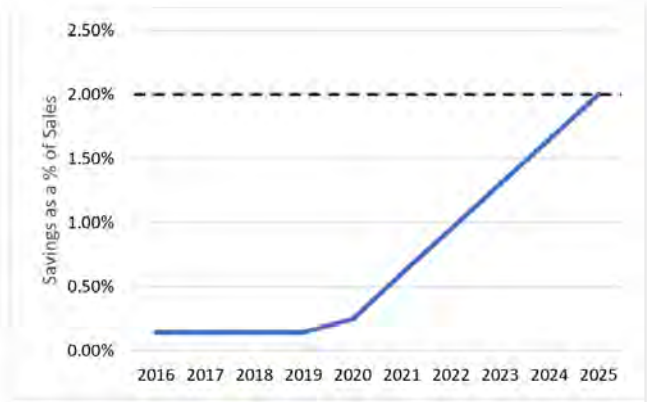

Figure 7. Potential 2 percent EERS savings ramp-up for Virginia.

PROGRAM PORTFOLIO MARKETS, TARGETS, AND CHARACTERISTICS

Residential

In successful energy efficiency program portfolios, residential program designs respond to the needs of homeowners and renters. All key savings opportunities from simple lighting improvements to whole-house retrofits are addressed through integrated and mutually supporting programs. These programs engage and motivate customers to participate by removing barriers and by offering technical support and financial incentives. Residential program strategies tend to fall into three primary categories: whole-house programs, efficient products, and behavior modification.

Whole-House Programs

Whole-house programs provide comprehensive energy upgrades, addressing all primary efficiency opportunities within a home. These involve improving insulation and reducing air leakage in walls, windows, and ceilings, and increasing the efficiency of the mechanical and electrical systems that heat and cool the indoor environment, heat water, and produce light, refrigeration, and other needs. A common feature of most effective whole-house programs is that they are fuel-neutral, addressing savings opportunities for electricity, gas, and / or bulk-delivered oil and propane. Moreover, they tend to provide services for both retrofit and new construction projects.

Retrofits. Whole-house retrofit programs usually involve a home energy audit and recommendations for energy-saving measures, along with financial incentives for implementing these recommendations.

New Construction. Residential new construction whole-house programs usually work with builders, contractors, architects, developers, code officials, and suppliers to promote the design and construction of efficient new homes. Similar to whole-house retrofit programs, successful new construction programs address all key end uses and building systems. Program incentives are usually tiered, with higher incentives available for greater levels of efficiency.

Multifamily. Providing comprehensive energy efficiency services to people who live in apartments can be difficult and is often overlooked by efficiency programs. At the root of this phenomenon is the split incentive problem, which is defined by the need for the owner to make an investment in building systems while the resident, who pays the energy bill, receives the benefit of reduced cost. (In other words, there is no payback to the owner.) The most successful multifamily programs comprehensively provide energy efficiency services, working with property owners, managers, and occupants to address the full spectrum of energy-saving opportunities.

Income-Eligible or Low-Income. Program administrators often offer programs specifically for income-eligible customers to reach those who might be unlikely or unable to participate in the residential programs described above. The goal of income-eligible programs is to assure that comprehensive efficiency services are provided to as many residents who need them as possible, regardless of their ability to afford them. The best income-eligible energy efficiency programs are deeply connected with local service providers delivering support to income-eligible people. Services might involve comprehensive energy audits and full-cost incentives for improvements related to building shell improvements, heating and cooling system efficiency improvement, appliance efficiency improvements, water heating efficiency improvements, and lighting efficiency improvements.

Efficient Products

Efficient products programs work with manufacturers and retailers to promote the stocking, marketing, and sale of efficient residential lighting, appliances, consumer electronics, domestic hot water equipment, and heating, ventilation, and air conditioning equipment to consumers. Efficient products programs complement whole-house programs by optimizing the efficiency of products that residential customers buy through contractors, or which are sold to them directly by retailers. These programs can provide financial incentives in the form of either traditional customer rebates or upstream buydowns.

Behavior Modification

Many residential portfolios also involve behavior programs. Although behavior programs are sometimes considered whole-house programs, their approach differs from the financial incentive-based program models used for the other whole-house programs. Behavior programs typically provide home energy reports to customers, to motivate them to reduce their energy use through social norming and behavioral change.

Commercial & Industrial

The C&I sector is far more diverse than the residential sector, encompassing everything from a small, independent retail store to a large highly specialized industrial facility. Successful program portfolios often include three broad programs in the C&I sector. These align with the decision processes of this diverse array of customers.

The first distinction in the decision process for the C&I sector is between retrofit and lost opportunity. This distinction recognizes a fundamental difference in the economic calculus for evaluating efficiency projects as part of new construction or other replacement of existing equipment (scheduled or at failure), which are defined as lost opportunities. Retrofit projects, on the other hand, are when existing equipment is in working condition and the project is motivated primarily by the energy savings. The next distinction is between small and large customers. Each should be addressed by its own program. Each has a different profile relating to facility characteristics, equipment types, purchasing processes, financial situation, and owner familiarity with energy efficiency. Further, certain program approaches might not be cost-effective for both segments.

The portfolio of efficiency programs directed at the C&I sector often consists of large umbrella programs with several different strategies or initiatives aimed at capturing savings from different segments of this diverse group of customers. The section below discusses the major program strategies included in each of the umbrella programs.

Lost Opportunity

A lost opportunity program applies when the customer is already purchasing new equipment, and incentives might need to offset only part or all of the cost difference between standard equipment and efficient equipment. A program would focus on the incremental cost and savings available. Lost opportunity programs can cover all end uses and technologies that produce cost-effective energy savings, and encompasses many different delivery models and services. These programs usually involve design and technical assistance for new construction and replace-on-failure projects, standard prescriptive incentives, and upstream incentives for common lighting measures.

Large-Business Retrofit

Large-business retrofit programs capture energy savings from existing large C&I customers. These programs encourage early replacement of inefficient equipment before it stops working, adding or improving controls or sensors to lower the energy use of existing systems, and helping businesses improve operational practices and optimize systems to lower energy use. Large-business retrofit programs can cover all end uses and technologies that produce cost-effective energy savings and encompass many different delivery models and services. Similar to lost opportunity programs, large-business retrofit programs use delivery strategies such as account management, prescriptive incentives, custom incentives, and technical and design assistance.

Small-Business Retrofit

Small businesses are typically constrained by both staff time and financial resources. This makes it hard to invest the time and money in identifying and installing efficiency upgrades. Further, the small amount of per-customer energy use in this segment means that the program administrators cannot cost-effectively spend too much time on each facility. Small-business retrofit programs often address these problems by combining free on-site audits with high financial incentives and easy application processes to achieve significant savings from high efficiency lighting and other easy-to-install efficiency measures.

BENEFITS OF ENERGY EFFICIENCY BEYOND ENERGY SAVINGS

Risk Reduction

Because the largest part of the cost of producing electricity is fuel, electric prices are highly correlated to underlying fuel commodity prices, which can be highly volatile, leaving ratepayers exposed to price shocks. The costs of energy efficiency, by contrast, are largely local labor and expenses, which can be ramped up and down more easily, and are much less exposed to the ups and downs of the global commodity markets.

Another type of risk relates to the construction of new generation facilities. These facilities may take 10 years or longer to begin producing power and are more exposed to unexpected capital cost overruns. Some states quantify the value of reduced risk from efficiency and include it as a benefit in cost-effectiveness testing. Vermont, for example, adds 10 percent to the benefits of avoided energy and capacity as a proxy for this risk reduction. However, this practice is still fairly rare.

Transmission and Distribution Avoidance

In addition to peak demand savings from avoided generation, there are often additional savings from lowering the load on the transmission and distribution system. These savings can be significant, but they are highly variable from jurisdiction to jurisdiction and difficult to estimate without a dedicated study.

Demand Reduction Induced Price Effects

Many states, especially in New England, are beginning to recognize demand reduction induced price effects (DRIPE) as a quantifiable benefit of energy efficiency and demand response. DRIPE is a measurement of the value efficiency provides by reducing the wholesale energy prices borne by all retail customers. The reduced energy demand due to efficiency programs removes the most expensive marginal generating resources and lowers the overall costs of energy. This reduces the wholesale prices of energy and demand, and this reduction is, in theory, passed on to retail customers. The effects on energy prices are small in terms of percentages, but the absolute dollar impacts are significant because the price reduction applies to all energy usage on the system.

Originally, it was thought that DRIPE would only be significant in the short-term. In the long run, market actors would react to lower energy consumption and peak demand by retiring inefficient generators. With lower available supply, wholesale prices would begin to increase again, assuming no other changes in demand. However, the most recent study on avoided costs in New England concluded that DRIPE impacts persist far longer than had been assumed. DRIPE effects in New England are now estimated to last 11 years for peak capacity reductions and 13 years for energy reductions. The value of DRIPE varies based on energy period and region, but for New England range from $0.001 per kWh to $0.032 per kWh and from $2.23 per kW to $59.07 per kW for peak demand.

Economic Development Benefits

There is a large and growing body of evidence that money spent on energy efficiency creates more jobs and provides a greater stimulus to local economies than equivalent money spent on supply-side resources. Efficiency investments are far more labor intensive than supply-side resources and require significant effort from contractors, design professionals, and suppliers and distributors. Academic research and interviews with business owners from process evaluations confirm that utility-run efficiency programs can be an enormous boon for small and local businesses. According to 2009 study done by the University of Massachusetts, Amherst, a $1 million investment in supply-side resources will create 5.3 jobs, while an equivalent investment in efficiency can be expected to create 16.7 jobs.[75] The table below shows estimates of the jobs effect of efficiency spending.[76] The multipliers are based on modeling by ACEEE, with multipliers adapted from a regional economic modeling tool. Typically, studies have found that around 10-20 net jobs are created per million dollars spent on efficiency.

Table 6. Effect of efficiency spending on jobs[77]

Spending Category	Impact	Amount (Millions)	Job Multiplier	Job Impact (job-years)
Installation	Upfront payment for efficiency measures	$100	13	1,300
Consumer spending	Because of efficiency spending, consumers spend less in the short term	-$100	12	-1,200
Consumer savings	Because of energy savings, consumers spend more in the long term	$200	12	2,400
Lost utility revenues	Utility revenues decrease because of energy savings	-$200	5	-1,000
Net effect of a $100 million investment in efficiency measures				**1,500**

[75] Throughout the report, one job represents one full-time job for one year.

[76] ACEEE. *Potential for Energy Efficiency, Demand Response, And Onsite Solar Energy in Pennsylvania.* April 2009.

[77] This study uses the same job multiplier as was found in the Pennsylvania ACEEE study, or 15 jobs per million dollars spent. This number is actually on the low side of multipliers found in the economic literature. When this paper references jobs created, it is referring to a job as one full time job for one year.

In addition to direct job benefits, one dollar of efficiency spending creates more than one dollar of economic activity. In economics, this is known as the multiplier effect. While every economic activity has some multiplier, the multiplier for efficiency spending is larger than that of many other activities, particularly compared with supply-side spending. The efficiency multiplier occurs as 1) people who are employed due to the efficiency program re-spend their new income in the economy; 2) increased demand for efficient products causes increased demand for upstream suppliers; and, 3) money saved by ratepayers from lower energy bills is spent on other goods and services.

These estimates have been validated by economic studies of specific investment decisions. For example, a 2009 study in East Kentucky found that efficiency investment of $634.2 million would create $1.2 billion of local economic activity and over 5,400 jobs, not including the effect of energy savings being reinvested into the local economy. A coal plant to produce the equivalent amount of energy would not only be more expensive, but would create only 700 jobs during the 3-year construction phase and 60 positions once operational.[78]

Health Benefits

Air pollution – such as sulfur dioxide, nitrogen oxides, and particulate matter emitted during electricity generation – causes health effects that damage both public well-being and the economy. Adverse effects include increased incidences of asthma, respiratory, and cardiac diseases; higher mortality rates; and increased medical and hospitalization spending. In fact, there is reason to believe that increased health costs due to air emissions effectively double the price of coal-fired electricity. A recent study from Harvard University finds that adverse health impacts from coal generation cost the public an average of 9.3 cents per kWh of power generated.[79,80] A study for the European Union estimates direct externalities at between 4 and 15 euro cents per kWh for coal generation, between 3 and 11 euro cents per kWh for oil, and between 1 and 3 cents per kWh for gas, consistent with the Harvard study.[81] Another study found that Ontario's electric generation produces 668 premature deaths, 928 extra hospital admissions, 1,100 extra emergency room visits, and 333,600 minor illnesses. The financial impact of these health effects is estimated to be over $3 billion per year. The study estimates total Ontario consumption at 26.6 Terawatt hours (TWh) per year, implying health costs for Ontario of over $0.11 per kWh.

Additionally, there is mounting evidence that, beyond these large-scale effects from generation, there is another set of health benefits at the building level. The effects of efficiency improvements to homes has a variety of health benefits to the residents, with documentation now including reduction in asthma, chronic obstructive pulmonary disease (COPD), and many other chronic health conditions. The health benefits are even greater when the efficiency measures are installed in low-income households.

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[78] Ochs Center for Metropolitan Studies 2009. "An Analysis of the Economic Impact of Energy Efficiency and Renewable Energy in the East Kentucky Power Cooperative Region." https://grist.files.wordpress.com/2010/11/ekpcgreenjobsreport.pdf.

[79] This is an average. The actual value varies widely from plant to plant based on its age, type of pollution controls, and downwind population.

[80] Epstein et al. Page 86. Full Accounting for the Life Cycle of Coal. http://www.coaltrainfacts.org/docs/epstein_full-cost-of-coal.pdf.

[81] European Commission Page 13. External Costs. http://www.externe.info/externe_2006/externpr.pdf.

Environmental Benefits

In addition to the health effects discussed above, emissions from electricity generation carry significant environmental costs. Although environmental damage can be very difficult to quantify, it can be avoided by investing in efficiency rather than traditional supply-side resources.

- Surface water and soil acidification
- Damage to vegetation and forests
- Contributions to coastal eutrophication, causing algal blooms, depletion of dissolved oxygen, changes in biodiversity, and losses in the tourism / fishing industry
- Faster weathering of buildings
- Reduced visibility from smog and haze
- Mercury accumulation in fish

Other Benefits

Efficient buildings tend to have smaller temperature swings, better lighting levels, less glare, lower temperature gradients, and better indoor air quality than standard buildings. These additional benefits partly improve participant comfort and quality of life, but may also manifest as decreased illnesses and increased worker productivity, which can translate into additional economic benefits. The links between buildings and occupant health and productivity are very complex and difficult to generalize. The Center for Building Performance Diagnostics at Carnegie Mellon University has created a database of studies that have attempted to quantify this link. Overall, it finds that building environments that are associated with efficiency, such as increased outside air circulation, individual control of lights, moisture control, and pollutant source controls reduce symptoms of illnesses such as flu, asthma, sick building syndrome, and headaches an average of 43 percent. Other measures, such as window views, natural ventilation, and increased day-lighting reduce symptoms by an average of 36 percent. Further, the studies find that lighting measures in offices increase worker productivity by a median of 3.2 percent. These estimates are highly uncertain, and the past efforts to quantify the benefits have found a range of from less than $10 to $50 per square foot over 20 years. Since the energy savings over 20 years for a typical LEED-certified building are about $10 per square foot, even the low range of this estimate would mean that health and productivity benefits equal the energy saving benefits of green buildings.[82]

[82] Kats, Greg, 2009. *Greening Our Built World.* Washington, DC: Island Press. https://islandpress.org/books/greening-our-built-world.

NEW VIRGINIA MAJORITY
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October 8th, 2021

Virginia Department of Energy
3405 Mountain Empire Road
Big Stone Gap, VA 24219-4634

Re: Virginia Department of Energy and other named stakeholders charged to provide a report to the Virginia General Assembly with recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at the least costs to ratepayers and recommendation on whether the General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity.

To Carrie Hearne, Associate Director, Energy Equity Programs at Virginia Department of Energy:

At New Virginia Majority (NVM), as we work to build progressive power with communities across the state, securing environmental justice (EJ) in the Commonwealth remains a key priority for our leaders, organizers, policy experts, and most importantly, the Virginians we organize with and provide civic engagement support to year after year. So, on behalf of NVM, we want to thank you for the opportunity to provide the Department ("the agency") and the other agencies (i.e., DEQ, State Corp. Commission, etc.) involved in developing this report with our policy recommendations on how the state should proceed with meeting the Virginia Clean Economy Act's (VCEA) clean energy mandates at the least costs to electric utility customers (ratepayers).

Our commitment to securing EJ for people-of-color, immigrant communities, working-class families, women, and all Virginians alike, as noted in our Ten-Year Vision (2019), is focused on supporting policy efforts that "*move us towards an equitable 100 percent clean and renewable energy plan*", "*ensure a just transition...*", and "*provide targeted support for low-income individuals and people of color to obtain credentials, post-secondary education, or workforce training in environmental, renewable energy, or related fields*."

This commitment is rooted in the decades-long struggle for EJ by the historically Black Lambert's Point community in Norfolk, Virginia, that has been resisting the combined health, environmental, social, and economic impacts from coal dust pollution emitted from coal-carrying cars and the twin-rotary dumpsters operating at the nearby Norfolk Southern coal terminal, one example of the many components of fossil fuel related infrastructure operating in Virginia. We continue to stand and fight with the Lambert's Point community and their demand that Norfolk Southern be required to "cover the coal!"

Energy affordability is a specific energy equity issue that we address through our EJ policy development and advocacy activities at NVM that has also prompted our interest in providing the detailed comments enclosed below. How affordable energy services are to Virginians in the future, specifically, low-income families, renters, and households of color, will be directly impacted by how the state implements the VCEA's renewable portfolio standards (RPS) and draws-down 100 percent of the CO_2 emissions from investor-owned utilities' (IOU) fossil-fuel based power plants. In Virginia, high energy burden, the percentage of household income spent on home energy bills, is systemic, varies in severity from

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region-to-region and by race and income, and is a statewide barrier to achieving economic justice.[1] [2] Additionally, hardship in affording energy services has been further exacerbated by the deep and continued relationship between the COVID-19 pandemic, the economic recession, and consequential health and economic inequities, as demonstrated by our state leaders' efforts to curb increases in household utility debt since the onset of the health crisis.[3]

Our enclosed comments respond to the following three research questions, which the agency requested public feedback on during the VCEA decarbonization modeling presentation on September 9, 2021.

(A) Are the key modeling assumptions right to get us on the VCEA trajectory that almost takes Virginia to its carbon-emissions goals by 2045?
(B) What potential additional policy measures should be considered for closing the gap between the decarbonization outcome the VCEA can help Virginia achieve by 2045 and the greater goal of achieving zero emissions economy-wide by then?
(C) What additional matters should the report drafters take into account?

Briefly, our comments raise the following key modeling recommendations for agency consideration.

1. **Energy efficiency**: Scenarios should incorporate energy efficiency into the model alongside solar, wind, and other resources and see if it is selected on a cost basis above the VCEA target levels.
2. **Energy efficiency**: Scenarios should be modeled to determine potential energy savings to electric customers if the energy efficiency targets extend beyond the 2025 schedule and are set at higher annual savings levels, such as at least two percent per year.
3. **Natural gas plants**: The model assumes that the current natural gas power plant capacity increases, reflecting planned builds. Given the uncertainty in new builds and the lack of demonstrated needs for new gas plants, the model should optimize for no new fossil capacity.
4. **Natural gas plants**: The gas plant capacity in the model remains constant through 2040. Maintaining these aging, inefficient plants through 2040 will be expensive and polluting.
5. **Energy storage costs**: Battery prices have plummeted in recent years, modeled battery price assumptions should be revisited and, at a minimum, a low-storage-price sensitivity run to evaluate benefits of near-term storage adoption.
6. **Distributed energy resources**: The Haiku model does not appear to currently differentiate between utility-scale and distributed energy resources (DERs). It would be valuable to incorporate the value of such distributed resources, including societal benefits.
7. **Demand growth assumptions**: The model should include both increased electrification and energy efficiency adoption rate assumptions and determine how much increased efficiency might offset increased demand from electrification.
8. **Demand growth assumptions**: The model does not appear to incorporate any additional load associated with extreme heat and global warming, which may affect capacity needs.
9. **Oil-fired plants**: Without more justification, oil-based plants should not be online in 2040.
10. **Societal costs and benefits; electricity imports:** Societal costs should be incorporated into the modeling; it is unclear if these costs are included in this "least-cost" optimization model. For

[1] Drehobl, A,. Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: American Council for an Energy-Efficient Economy, https://www.aceee.org/research-report/u2006
[2] Virginia Energy Burden Data (US DOE LEAD Tool). Provided by DMME.
[3] 2020-2022 Budget (Acts of Assembly Chapter 1); Amended 2021 Special Session II, https://lis.virginia.gov/cgi-bin/legp604.exe?213+ful+CHAP0001 *See "e. Utility Assistance."*

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example, potential considerations include health costs associated with cross-state or regional air pollution from imported electricity.

Our comments also raise these policy recommendations for agency consideration.

1. **RPS implementation:** Enforce stronger requirements for IOUs to present and implement least-cost options for meeting the VCEA's RPS mandates.
2. **RPS implementation:** Ensure that the next Virginia Energy Plan adheres to legislative changes that direct forthcoming plans to include equitable procurement and operation of clean energy resources.
3. **RPS implementation:** Ensure Virginia charts a least-cost pathway to electricity sector decarbonization in the upcoming Virginia Energy Plan.
4. **Federal clean energy standards:** The next Virginia Energy Plan should account for ratepayer costs associated with potential congressional action on a Clean Electricity Performance Program and/or a Clean Energy Standard.
5. **Social costs of carbon**: Update and expedite the State Corporation Commission's ("Commission") implementation of the VCEA's social costs of carbon directive.
6. **Distributed generation:** Fully implement, fund, and expand state policies that govern the development of distributed generation, especially policies that support low- income energy efficiency programs, solar + storage resiliency, and multifamily and community solar programs.
7. **Distributed generation**: Fully fund the Low-to-Moderate Income (LMI) Solar Loan and Rebate Fund ($2 million/year) and support equitable regulatory implementation of Dominion Energy's shared and multifamily solar programs (esp. equitable minimum bill requirements).
8. **Certificates for new fossil-fuel fired power plants**: Permanently repeal the ability to obtain state certificates for the construction and operation of fossil fuel-fired power plants.
9. **Low-income programs:** Shift the funding guidance in the code for the Percentage of Income Payment Program (PIPP) as a " floor" rather than a cap and reinclude home retrofits as an eligible investment of program funding.
10. **Historically economically disadvantaged communities (HEDCs)[4]:** In the VCEA, an HEDC is (i) a community in which a majority of the population are people of color or (ii) a low-income geographic area.[5] Require IOUs and agencies to fully maximize the protections and benefits included in the VCEA for communities of color and low-income areas by creating specific goals for reducing energy burden across the state and guaranteeing the maximum energy savings and energy burden reductions achievable through these policy provisions.
11. **Fair electricity rates, customer overcharge protections**: As the state transitions to 100 percent renewable energy resources, enact fundamental utility reforms introduced in the General Assembly to allow for fair electricity rate setting and protect customers from high fixed energy costs and overcharges.
12. **Energy efficiency:** If electricity sector decarbonization is expedited through federal and/or state clean energy requirements, ensure low-income customer protections and HEDC benefits are

[4] Virginia Clean Economy Act (2020), "Historically economically disadvantaged community" means (i) a community in which a majority of the population are people of color or (ii) a low-income geographic area."

[5] Virginia Clean Economy Act (2020) https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

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adjusted and expanded so the share of new investments and benefits are distributed to levels proportionate to or exceeding the percentage of vulnerable populations in the state.

13. .**Energy efficiency:** Ensure that Dominion Energy, by its next Demand-Side Management (DSM)/energy efficiency proceeding in 2022, meets the set of three requirements included in the Commission's final order for the utility's 2021 proceeding.
14. **Energy efficiency:** Increase the annual energy savings requirements in the state's Energy Efficiency Resource Standard (EERS) by at least two percent per year.
15. **Energy efficiency:** Executive administration, General Assembly, and key agencies must remain firm on the statutory requirement to deny any IOU utilities approval for constructing new fossil fuel-fired power plants in the event utilities do not achieve the required annual energy savings in any given year.
16. **Energy efficiency:** Increase energy efficiency funding for the state's vulnerable populations beyond the 15 percent requirement to levels proportionate to or exceeding the percentage of vulnerable populations in the state.[6]

The end of this report also includes some early considerations for the agency's 2022 report on the relationship between implementation of the VCEA and disproportionate impact in HEDCs.

We believe our comments identify policy gaps and opportunities that are critical for the agency to consider to ensure the VCEA furthers, rather than detracts, from securing environmental justice and energy equity in Virginia as key agencies (both regulatory and non-regulatory), public utilities, and other energy suppliers implement the 100 percent clean energy policy over the next three decades.

Thank you again for this opportunity, and we look forward to reviewing the final report that will be approved by the executive administration and presented to the General Assembly this coming January.

Sincerely,

Tyneshia Griffin
Environmental Policy Analyst

Kenneth Gilliam
Policy Director

Enclosure

CC: Erik Olson, Energy Analyst at Virginia Department of Energy, Chris Bast, Chief Deputy Virginia Department of Environmental Quality, Renee Hoyos, Environmental Justice Director, Virginia Department of Environmental Quality

Technical review provided by the non-profit research institute Physicians, Scientists, and Engineers for Healthy Energy (PSE).

[6] Virginia Clean Economy Act (2020) https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

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Modeling and Policy Recommendations for Achieving the VCEA's Mandates at Least-Costs to Ratepayers

Question (A): VCEA Preliminary Modeling Assumptions

Not all of the assumptions incorporated into the Haiku model are transparently reported in the September 9, 2021 webinar presenting initial findings. The suggestions below regarding preliminary modeling assumptions reflect this uncertainty.

- **Energy efficiency:** The modeling assumptions appear to set energy efficiency adoption rates at the same level as VCEA targets. However, energy efficiency is often one of the cheapest ways to meet electricity demand. It may be valuable to incorporate energy efficiency into the model alongside solar, wind, and other resources and see if it is selected on a cost basis above the VCEA target levels. In this case, the VCEA targets would be used in the model to define a minimum value for annual efficiency savings. The VCEA efficiency target for Dominion is a five percent reduction in demand from 2019 levels by 2025, and for Appalachian Power is two percent from 2019 levels. While these targets result in a much higher annual DSM savings of just over one percent per year—as compared to historic efficiency savings of 0.11 percent per year in 2019—the targets are still well below the two percent per year achieved in numerous other states, including Maryland.[7] [8]

  It is also unclear if the model assumes there will be any additional efficiency measures adopted after 2025, which leaves out a large potential resource. If it does not, scenarios should be modeled to determine potential energy savings to electric customers if the energy efficiency targets are continued beyond 2025. Residential energy efficiency can provide additional benefits, such as helping reduce energy cost burdens; these benefits are particularly valuable for low-income households, especially when coupled with low-income efficiency programs. Additional policies above and beyond the VCEA, including electric utility decoupling and more ambitious energy efficiency targets (which should be modeled), can help the state adopt higher levels of efficiency and reduce utility bills.

- **Natural gas plants:** The model assumes that the current natural gas power plant capacity increases slightly by 2025, reflecting planned builds, but at least one of two planned natural gas combined-cycle plants have been cancelled.[9] While unclear if this plant is still in the model, given the uncertainty in these builds and the lack of demonstrated needs for new gas plants, the model should optimize for no new fossil fuel capacity. In addition, the gas plant capacity in the model remains constant through 2040. This assumption seems unrealistic. As of 2020, Virginia had

[7] Weston Berg et al. "The 2020 State Energy Efficiency Scorecard." *American Council for an Energy Efficient Economy*. December 2020. www.aceee.org/sites/default/files/pdfs/u2011.pdf
[8] Berg, W., S. Vaidyanathan, B. Jennings, E. Cooper, C. Perry, M. DiMascio, and J. Singletary. 2020. The 2020 State Energy Efficiency Scorecard. Washington, DC: ACEEE. aceee.org/research-report/u2011.
[9] Wilson, Patrick. "Central Virginia Pipeline Developer Wants Regulators to Find They Don't Need to Approve Project." Richmond Times-Dispatch, September 3, 2021. https://richmond.com/news/state-and-regional/central-virginia-pipeline-developer-wants-regulators-to-find-they-dont-need-to-approve-project/article_131dd1f1-f14c-59a9-96d2-f86ffb3b3a18.html#tncms-source=login.

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15,400 MW of natural gas plant capacity. This includes more than 1,500 MW of gas steam turbines, the majority of which were built in the 1960s and 1970s. Maintaining these aging, inefficient plants through 2040 will be expensive and polluting. More than 30 percent of Virginia's total gas capacity was built in 2000 or before, all of which will be over 40 years old in 2040.[10] Given the growth in renewables, plummeting costs of energy storage, and potential for resources such as demand response to reduce capacity needs, these plants will likely be comparatively expensive and redundant by 2040. Even if they are used less frequently than before, they will still continue to emit health-damaging air pollutants such as nitrogen oxides, which contribute to the formation of ozone and particulate matter and can have adverse cardiovascular and respiratory impacts on populations living near and downwind from these plants.

Further, start-up and ramping operations, which may increase as plant capacity factors decrease and the plants increase their load-following behavior, are less efficient than steady-state operation and may also increase pollutant emission rates.[11] Diesel generators attached to these facilities, which must be tested regularly and can provide black-start capabilities, often have lower stack heights, and can also contribute to air pollutant emissions. Retirement of these facilities would help mitigate these pollutant sources.[12]

Moreover, 82 percent of the state's gas plants have a larger share of low-income populations living within a 3-mile radius than the state median, meaning they are disproportionately located in low-income communities.[13] Communities with high socioeconomic and health burdens may be most vulnerable to environmental health hazards and often face high cumulative environmental health burdens; retiring plants in these communities may be particularly valuable.

- **Energy storage costs:** It is unclear what battery energy storage costs are being incorporated into the model, but the values are likely high given that the model does not select additional battery storage until after 2035. Battery storage has recently out-competed gas resources in numerous cases, including but not limited to 1) a 400 MW installation that just replaced the gas-fired Moss Landing Power Plant in California,[14] 2) 150 MW and 175 MW battery systems that just won the bid in the forward capacity market in New England,[15] 3) and a $33/MWh power purchase agreement for solar + battery storage signed by the Los Angeles Department of Water and Power in 2019.[16] Given that battery prices have plummeted 90 percent in the last ten years and are

[10] U.S. Energy Information Administration. "Form EIA-860." 2021. www.eia.gov/electricity/data/eia860/
[11] Katzenstein, Warren, and Jay Apt. "Air emissions due to wind and solar power." (2009): 253-258.
[12] SIemens Energy. "Siemens Energy wins its first black-start battery storage project for power generation in the US." *Power Magazine.* January 28, 2021.
[13] U.S. Environmental Protection Agency. "Power Plants and Neighboring Communities tool." 2021. www.epa.gov/airmarkets/power-plants-and-neighboring-communities
[14] James Herrera. "World's largest energy storage system completes Phase II in Moss Landing." *Monterey Herald.* August 1, 2021. www.montereyherald.com/2021/08/19/worlds-largest-energy-storage-system-completes-phase-ii-in-moss-landing/
[15] Todd Olinsky-Paul. "With forward capacity auction success, batteries are winning in New England." *Utility Dive.* September 28, 2021. www.utilitydive.com/news/with-forward-capacity-auction-success-batteries-are-winning-in-new-england/607282/
[16] Jeff St. John. "L.A. Looks to Break Price Records With Massive Solar-Battery Project." *Greentech Media.* July 1, 2019. www.greentechmedia.com/articles/read/ladwp-plans-to-break-new-low-price-records-with-massive-solar-battery-proje

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expected to continue to fall,[17] the model battery price assumptions should likely be revisited and, at a minimum, a low-storage-price sensitivity run.

- **Distributed energy resources:** The Haiku model does not appear to differentiate between utility-scale and distributed energy resources (DERs), but it may be valuable to incorporate the value of such distributed resources. For example, solar + battery storage can provide resilience benefits and reduce the need for distribution upgrades. Furthermore, it appears that some distributed resources, such as demand response, are not included at all. The exclusion of these resources may contribute to the potentially erroneous conclusion that gas plant capacity must be maintained at current levels until 2040. In general, increased distributed resources such as demand response, energy storage, and smart electric appliances can increase grid flexibility, help integrate renewable resources, and provide resilience to extreme weather and climate impacts.

- **Demand growth assumptions:** The projected electricity demand modeled in these scenarios does not reflect the levels of increased electricity demand from appliance and vehicle electrification that will be needed to achieve economy-wide decarbonization. The model currently only includes somewhat-meaningful levels of electric vehicles in a sensitivity case, but even this case does not appear to reflect the level of adoption required to decarbonize all sectors; furthermore, the sensitivity cases do not reflect increased building electrification. These omissions make it difficult to determine real future capacity needs, and the potential need to increase annual energy savings from demand-response and energy efficiency and accelerate distributed and utility-scale renewable energy build rates. It would be valuable to both increase electrification and energy efficiency adoption rate assumptions in the model and determine how much increased efficiency might offset increased demand from electrification. In addition, the model does not appear to incorporate any additional load associated with extreme heat and global warming, which may affect capacity needs.

- **Oil-fired plants:** The model assumes there will be oil-fired plants online in 2040. While these plants are typically used infrequently, they have high emission rates of criteria air pollutants per MWh of electricity generation, are inefficient, and old. Of the state's 984 MW of oil-fired plant capacity, 70 percent is more than 20 years old; some of these plants were built as long ago as 1963, meaning they will be nearly 80 years old in 2040.[18] There is little justification for these plants to still be online in 2020, much less in 2040.

- **Societal costs and benefits:** It is unclear if any societal costs are included in this "least-cost" optimization model. Ratepayers will be impacted not only by the cost of electricity supply, but also by air pollutants and by climate change itself. Furthermore, some technologies provide benefits not reflected here, such as resilience provided by distributed solar + battery storage and microgrids. Efficiency measures such as insulation can improve home comfort and reduce risks to vulnerable populations from climate impacts such as heat waves. The model would likely shift more heavily towards renewable energy options if it incorporated the impacts of carbon, lifecycle

[17]Bloomberg New Energy Finance. "Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137/kWh." December 16, 2020. https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/

[18] U.S. Energy Information Administration. "Form EIA-860." 2021. www.eia.gov/electricity/data/eia860/

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methane emissions associated with natural gas consumption, and criteria pollutant emissions from fossil fuel combustion, among other societal impacts and benefits.

- **Electricity imports:** It is unclear why electricity imports are not fully reflected in this model. Imported electricity from fossil fuel generators still produces carbon dioxide and health-damaging air pollution, which in the latter case can affect air quality in Virginia even if the generator is located in another state.

Question (B) & (C): Policy Considerations for Meeting the VCEA's Mandates and Virginia's Economy-wide Climate Goals by 2045

1. Policy considerations related to Virginia's Renewable Portfolio Standard (RPS) and the Repeal of Certificates for Public Convenience and Necessity (CPCN) for development of fossil-fuel fired power plants.

- **RPS Implementation:** The central provision of the VCEA is the RPS, which sets the state's IOUs on a three-decade trajectory to eliminate carbon emissions through gradual decommissioning of fossil fuel-fired power plants across the Commonwealth by 2045 for Dominion Energy and 2050 for Appalachian Power. Given the assumptions included in the modeling to-date projecting the least-cost pathway to electricity sector decarbonization, it can be objectively assumed that even with the expected increases in demands, renewable energy generation can meet expected new demand growth from both residential and commercial customers as noted in the modeling presentation. The capability for renewables to meet new demand growth in the future is a welcomed projection; however, this, nor an expedited RPS due to any future state or federal policy action, cannot be achieved without stronger accountability for IOUs to present and implement least-cost options for meeting the VCEA's mandates with key agencies (e.g., State Corp. Commission),[19]the General Assembly, and forthcoming executive administrations as they each develop and implement their own plan ("Virginia Energy Plan") for how to power the Commonwealth over the course of their administration.

  One area where state agencies could provide strong oversight in the near term to ensure we chart a least-cost pathway to electricity sector decarbonization is in the upcoming development of the next Virginia Energy Plan, which often influences the administration's introduced energy legislation and budgetary recommendations during legislative sessions. It should be ensured that the next energy plan adheres to recent legislative updates that direct forthcoming plans towards equitable procurement and operation of clean energy resources, which in many ways align with the recommendations that the White House Advisory Council on Environmental Justice (WHEJAC) provided to President Biden on best EJ practices for clean energy investments to be made through the federal Justice40 initiative. Some of these updates to the Virginia code include ensuring "*the availability of reliable energy at costs that are reasonable and in quantities that will support the Commonwealth's economy*," preventing "*energy inequities in historically economically disadvantaged communities,*" and increasing "*access to clean energy and the*

[19]Bade, Gavin. "In First, Virginia Regulators Reject Dominion Integrated Resource Plan." Utility Dive, December 10, 2018. https://www.utilitydive.com/news/in-first-virginia-regulators-reject-dominion-integrated-resource-plan/543988/.

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benefits from clean energy to historically economically disadvantaged communities."[20] [21] IOUs also need to be held accountable if RPS requirements are not achieved in the upcoming year, as there are penalties in the VCEA (e.g., deficiency payments) if this unfortunately occurs.[22]

- **Preparing for Federal Clean Energy Standards and Funding:** The next energy plan should also thoroughly consider the cost implications for ratepayers of potential congressional action to fund and implement a Clean Electricity Performance Program (known as "CEPP") and/or a Clean Energy Standard (CES) that incentivize the procurement of clean energy resources with the intention of meeting President Biden's 2035 zero carbon emissions goals.[23] Federal incentives and/or requirements that can expedite the time by which IOUs can meet the state's decarbonization goals can provide welcomed public health benefits and prevent climate damages, especially for EJ communities[24] who have been disproportionately impacted by fossil fuel infrastructure for generations or are newly resisting its nearby expansion (e.g. Charles City, Pittsylvania Co.)[25] [26], but such changes could also increase energy costs for ratepayers depending on how federal and state policy-makers and regulatory agencies allow utilities to recover costs and secure profit guarantees for meeting any new federal clean energy goals and requirements.[27]

- **Requiring Rulemaking on Social Costs of Carbon:** Another area where agency regulatory action could assist in ensuring the state adheres to a least-cost pathway towards its energy decarbonization goals is updating and expediting the requirement for the Commission to take agency leadership in implementing the VCEA's directives on the Social Cost of Carbon (SCC).[28] The VCEA explicitly gives this regulatory authority to the agency: "*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…*"[29]

  Pursuing the implementation of this authority at the Commission while the state is in the early stages of implementing the RPS, whether through the issuance of agency guidance, regulations,

[20] § 45.2-1706.1. (Effective October 1, 2021) Commonwealth Clean Energy Policy.
[21] "White House Environmental Justice Advisory Council Final Recommendations: Justice40, Climate and Economic Justice Screening Tool and Executive Order 12898 Revisions." EPA. Environmental Protection Agency. Accessed October 5, 2021. https://www.epa.gov/environmentaljustice/white-house-environmental-justice-advisory-council-final-recommendations.
[22] § 56-585.5. Generation of electricity from renewable and zero carbon sources. *See D. (5).*
[23] Executive Order 14008, " Tackling the Climate Crisis at Home and Abroad," 86 Federal Register 7619, February 1, 2021. Campaign quote comes from https://joebiden.com/clean-energy/# , accessed January 15, 2020.
[24] Article 12. Virginia Environmental Justice Act. § 2.2-234. Definitions, ""Environmental justice community" means any low-income community or community of color."
[25] Wilson, Patrick. "Central Virginia Pipeline Developer Wants Regulators to Find They Don't Need to Approve Project." Richmond Times-Dispatch, September 3, 2021.
[26] "Southside Virginia Pipeline Compressor Station Raises Environmental Justice Concerns," April 27, 2021. Southside Virginia Pipeline Compressor Station Raises Environmental Justice Concerns. https://www.cbf.org/news-media/newsroom/2021/virginia/southside-virginia-pipeline-compressor-station-raises-environmental-justice-concerns.html.
[27] Lawson, Ashley J., Clean Energy Standards: Selected Issues for the 117th Congress § (2021). https://sgp.fas.org/crs/misc/R46691.pdf
[28] Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990: "The SC-GHG is the monetary value of the net harm to society associated with adding a small amount of that GHG to the atmosphere in a given year. In principle, it includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk, natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services."
[29] § 56-585.1 Generation, distribution, and transmission rates after capped rates terminate or expire. https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

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etc., can ensure that the Commission and other state agencies have recommendations on best practices for and the capacity to monetize "the value of changes in greenhouse gas (GHG) emissions resulting from regulations and other relevant agency actions." This in turn can provide more equitable, accurate, and comprehensive cost estimates for proposals (e.g., resource planning, approval and cost-recovery for new generation, DSM/energy efficiency) brought to the Commission for electric generation buildout. This will provide invaluable, more comprehensive cost estimates that are Virginia-focused and reflect what costs are likely to be incurred by continued construction and operation of fossil fuel-fired power plants over time (as well as renewable energy generation facilities) and more accurately characterizes the economic costs, public health, (incl. co-pollutants alongside GHG emissions), and environmental benefits Virginians can gain from transitioning to a 100 percent renewable energy system.[30]

Pursuing updates and implementation steps for this provision of the VCEA is not only important to provide more explicit criteria and urgency to the regulatory agency, but to also ensure the agency continues to use the most recent technical assistance from the Interagency Working Group on Social Cost of Greenhouse Gases from the United States Government, as there has been a new executive order (i.e., E.O. 13990) requiring a thorough 2022 update to the 2016 technical support document (TSD) that is referenced in the VCEA and a new interim TSD with updated valuations for the social costs of carbon has also been released with different climate valuations since the enactment of the VCEA.[31] [32]

- **Prioritizing and Expanding Distributed Generation:** Although concerningly not explored thoroughly in the agency's modeling (as of September 9th), fully implementing, funding, and expanding state policies that govern the development of distributed generation (DG) is essential to implementing the VCEA at least-cost to ratepayers. It can have a considerable impact on achieving the state's decarbonization goals at least-cost and provide particular benefits to those who need it, particularly through low-income energy efficiency programs, solar + storage resiliency, and multifamily and community solar programs that can assist customers with the highest energy burdens. DG can also provide greater emissions reductions in addition to these potential energy savings.[33] Development of DG is also critical for utilities to equitably meet the VCEA's requirements for siting renewable energy facilities in HEDCs,[34] a directive that is essential to facilitating household and community-level generation, especially for climate disaster resilience (e.g., resiliency hubs) and actualizing reparative justice for communities disproportionately impacted by and divested from the benefits of the status quo fossil fuel-based energy industry.[35] It is also critical for the state to meet clean energy goals that are to be considered in the state's next energy plan, as mentioned above.[36]

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[30] Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 § (2021). https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf?source=email

[31] Ibid.

[32] "Executive Order 13990 of January 20, 2021, Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis," *Code of Federal Regulations*, (2021): 7037-7043, https://www.govinfo.gov/content/pkg/FR-2021-01-25/pdf/2021-01765.pdf

[33] Drehobl, A,. Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: American Council for an Energy-Efficient Economy.

[34] Virginia Clean Economy Act (2020), See Enactment Clause 7, https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

[35] Talia Lanckton, and Subin Devar. Rep. Justice in 100 Metrics Tools for Measuring Equity in 100% Renewable Energy Policy Implementation, 2021, https://iejusa.org/wp-content/uploads/2021/03/Justice-in-100-Metrics-2021.pdf

[36] § 45.2-1706.1. (Effective October 1, 2021) Commonwealth Clean Energy Policy.

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Examples of delayed,[37] but urgently needed state government action on DG that can help halt exponential increases in energy costs for LMI households (including both renters and homeowners), include funding the Low-to-Moderate Income Solar Loan and Rebate Fund (the Fund) established in 2019 and supporting an equitable rulemaking and implementation of Dominion Energy's shared and multifamily solar programs. The fund, with initial and continued financial investments, would support a public-based LMI Solar Pilot Program in Virginia developed and supported by the Clean Energy Advisory Board, which has already completed some preliminary research on program design and implementation with the help of Clean Energy States Alliance (CESA) and the agency.[38] A starting public investment is recommended by research performed for the board by the CESA; $2 million per year is recommended by the Virginia Conservation Network (VCN). This program, if fully funded, could provide energy savings and wealth generation for customers in co-op and municipal utility territories where electric customers would not directly benefit from Dominion Energy's shared or multifamily solar programs, while also supporting the electricity sector draw-down by 2045.[39]

As it relates to the Dominion Energy shared and multifamily solar programs, there is another valuable recommendation for their implementation from VCN's 2022 Common Agenda: "utilize regulatory and legislative opportunities at disposal to expand the Dominion Energy shared solar program to all customers…, and prohibit utilities from charging unreasonably high minimum bills for shared solar customers."[40] The success of both the state's LMI Solar Pilot Program and Dominion Energy's shared and multifamily solar programs and the scale of the positive impact that these types of DG efforts can have on decarbonization outcomes are strongly dependent on the state's efforts to require the prioritization of best practices[41] for affordability and equity in energy assistance programs via regulatory decisions and supporting them where needed with financial investments from available utility, state, and federal resources.[42]

- **Permanent Repeal of CPCNs for Constructing and Operating New Fossil-Fuel Generation Facilities:** As it relates the state's successful implementation of the RPS at least-cost to ratepayers, we also recommend that the state do in fact permanently repeal the ability for the Commission (i.e., both IOUs and Independent Power Producers) to issue CPCNs for any proposed fossil fuel-based electric generating units. Given the ongoing rapid decline in battery prices, low cost of solar, and clean energy resources out-competing fossil resources across the country, adding additional fossil fuel-fired power plants will be an increasingly expensive strategy for meeting electric load. Building new fossil fuel power plants now also runs the risk that these facilities will become stranded assets if forced to reduce production or retire before achieving payback, which is likely given the need to mitigate carbon emissions and the potential for

[37] Note: Agency requests have been submitted, but not included in the Governor's budget proposal for the General Assembly to-date for fully funding the Low-to-Moderate Income Solar Loan and Rebate Fund.
https://www.dmme.virginia.gov/de/LinkDocuments/Clean%20Energy%20Advisory%20Board/Reports/2020%20Annual%20Report,%20Clean%20Energy%20Advisory%20Board.pdf
[38] Clean Energy States Alliance (CESA), Market Research for Developing an LMI Solar Pilot Program in Virginia , 2020.
[39]Barnes, Chelsea, Vincent Bowhers, and Will Cleveland. "Bringing More Resilient Energy to Virginia Communities." Accessed October 5, 2021. https://vcnva.org/wp-content/uploads/2021/08/Bringing-More-Resilient-Energy-to-Virginia-Communities.pdf.
[40]Ibid.
[41] Drehobl, A,. Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: American Council for an Energy-Efficient Economy. https://www.aceee.org/research-report/u2006
[42] Virginia Clean Energy Advisory Board (CEAB), Comments to the State Corporation Commission on Dominion Energy's Shared and Multifamily Solar Programs. (2020)

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federal-level directives to accelerate the retirement of these facilities. Nationwide, ratepayers are being forced to pay for the early retirement of coal plants; gas plants pose the same investment risk. In addition, gas prices are volatile, and renewable energy resources provide a hedge value against this volatility and the risk that gas prices will spike.[43] Investing in additional fossil fuel power plants also presents an opportunity cost: any investments in fossil infrastructure represents money that could have been invested in solar, wind, battery storage, and other clean resources—and which would eventually be required investments anyway to meet clean energy and decarbonization targets.

2. *Policy considerations related to increasing equity and energy affordability through low-income carve outs, aid for HEDCs, and state-based energy assistance programming enacted in the VCEA.*

- **Maximize Energy Savings And Climate Benefits Through Aid For HEDCs And Low-Income Customers Protections And Benefits Included In The VCEA:** Throughout several of the key sections of the VCEA are HEDC and low-income (LI) customer protections and benefits intended to make the transition more equitable and affordable by 1) providing LI individuals and families with the opportunity to participate in more net energy metering within each IOU territory, 2) prioritizing renewable energy services through qualifying low-income IOU and DG projects, 3) siting renewable facilities in HEDCs, and , 4) excluding LI customers from expensive costs associated with the offshore wind generation placed in the public interest.

  Although it has been demonstrated that LI customers' needs often exceed resources made available through utility-administered LI programs, if IOU utilities and agencies are required to fully maximize these VCEA provisions (i.e., implement funding and programming requirements as a floor rather than a cap), it can ensure LI customers fully benefit from these protections and opportunities 1) via avoiding exponential increases in energy costs per household and creating energy savings, and 2) increasing climate benefits for all Virginians given that low-income households are likely to have higher energy burdens compared to median-income customers.[44]

  It is also critical to ensure the development of well targeted program goals and outreach strategies to increase enrollment in programs for low-income areas and other historically underserved populations. Ongoing and consistent data collection and transparent public reporting can assist with measuring program impact (i.e., aggregated by income or census tract to protect privacy).[45] It would also be valuable for utilities and agencies to not only identify LI populations facing high energy burdens, but also linguistically isolated[46] populations and communities of color.

[43] Mark. Bolinger et al. "Quantifying the value that wind power provides as a hedge against volatile natural gas prices." *Lawrence Berkeley National Laboratory.* 2002. https://emp.lbl.gov/publications/quantifying-value-wind-power-provides

[44] "Where utilities do administer programs targeted at low-income customers, participant needs far exceed available resources. Reames, Stacy, and Zimmerman (2019) found that 11 large investor-owned utilities across six states have distributional disparities in low-income investments; that is, they do not spend energy efficiency dollars proportionally on programs designed to reach low-income populations," https://www.aceee.org/research-report/u2006

[45] Drehobl, A,. Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: American Council for an Energy-Efficient Economy. https://www.aceee.org/research-report/u2006

[46] Linguistic isolation: "Percent of people in a block group living in linguistically isolated households. A household in which all members age 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is linguistically isolated,"https://www.epa.gov/ejscreen/overview-demographic-indicators-ejscreen

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If decarbonization of the electricity sector is in fact expedited through federal and/or state clean energy requirements and incentives, an additional concern here is how HEDC and low-income customer protections and benefits should be adjusted and expanded so the share of new investments and benefits are distributed to levels proportionate to or exceeding the percentage of vulnerable populations to ensure this investments are equitable and meet the needs HEDCs.[47]

- **Enact Utility Reforms To Allow For Fair Electricity Rate Setting And Protect Customers From High Fixed Energy Costs And Overcharges:** Since the 2020 Regular General Assembly session, we have been actively supporting policy development and advocacy efforts to pass fundamental utility reforms that can increase energy affordability and reduce high energy burdens across the state. Legislation introduced in 2021 such as HB 2200, HB 1984, and HB 2160 focused on restoring the Commission's authority to set fair, forward-looking electricity rates, set profit authorizations for IOUs that are based on market conditions, and ensure customers receive 100 percent of the refunds they are due when overcharged for energy service.[48] The importance of this policy priority is illuminated by the Commission's staff recent reporting that Dominion Energy, from 2017 to 2020, took in more than $1 billion in customer overcharges, and despite this excessive profit, only $312.4 million may be available for customer refunds, and rates can only be reduced by $50 million due to statutory restrictions on rate reductions.[49]

  We have also been supportive of policies such as HB 528 (2020) that requires the Commission to prioritize the needs of utility customers when decommissioning coal-fired power plants, which is important for reducing high fixed charges that may be associated with closing these facilities in Virginia (e.g., rate adjustment clauses known as "riders"). Fixed charges, such as riders, are drivers of household energy burden and counterproductive to both increasing energy affordability through energy savings programs and should be mitigated to protect customers from exponential increases in energy costs over a short period of time due to the accelerated cost-recovery options available to IOUs for expensing new energy resources.[50] Enacting legislation that advances policy solutions included in the recently introduced utility reform bills, such as those mentioned above,[51] will strengthen utility customer protections in state law to secure a just transition that puts an end to these types of egregious utility financial activities and guarantee a more effective least-cost option for transitioning Virginia's grid to 100 percent renewable energy resources.

- **Maximize Energy Savings, Health, Environmental, And Climate Benefits Through PIPP:** Enacted in 2020 through the VCEA, and amended in 2021, the PIPP program is a well-known energy assistance program designed to both subsidize low-income households' energy bills, while also reducing those costs through deep home retrofits and energy efficiency measures. This

[47] Note: President Biden's Justice 40 Initiative dedicates "40 percent of the overall benefits of relevant federal investments to disadvantaged communities", and New York's Climate Plan ensures that "at least 40 percent of the benefits of clean energy investments benefit disadvantaged communities."
[48] Note: 2021 General Assembly Utility Reform Legislation: S.B. 1292 (McClellan), H.B. 1914 (Helmer), H.B. 1984 (Hudson), H.B. 2049 (Bourne), H.B. 2160 (Tran), H.B. 2200 (Jones), https://lis.virginia.gov/cgi-bin/legp604.exe?212+sbj+056
[49] Case No. PUR-2021-00058, Dominion Energy Rebuttal Testimony, SCC Staff Recommendations Regarding Refunds and Rate Reductions, https://scc.virginia.gov/docketsearch/DOCS/5mt%2301!.PDF
[50] Drehobl, A,. Ross, L., and Ayala, R. 2020. How High are Household Energy Burdens? Washington, DC: American Council for an Energy-Efficient Economy.
[51] Griffin, Tyneshia. "For Low-Income, Black, and Latinx Households, the Passage of the Fair Energy Bills Act Is Crucial." New Virginia Majority. Accessed October 5, 2021. https://www.newvirginiamajority.org/fair_energy_2020.

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two-prong approach can decrease energy consumption enough to make energy bills affordable for participating households over the long-term relative to their income. The success of this new state program will also depend on sufficient targeting for effective outreach to eligible households, lower bureaucratic barriers to program entry for participation (e.g., direct enrollment and/or verification options, multi-lingual accessibility), and strategic enrollment strategies (e.g., one-stop shop for incentives, information, enrollment, contractors, etc.),The Virginia PIPP program, as amended, does include a funding cap and no longer includes provisions for supporting deep home retrofits that are often important for decreasing the low-income housing stock that may be ineligible for energy efficiency updates due to poor housing conditions or building construction.[52, 53]

Although funding has been made available to the state through 2021 Regional Greenhouse Gas Initiative (RGGI) allowance auctions for use by the Department of Housing and Community Development to increase the low-income housing stock that is available for energy efficiency upgrades (note: ratepayers fund utilities costs recovery for required emissions allowances[5455]), this is a declining revenue source given that the availability of emissions allowances through regional cap-and-trade program decrease year-after-year. Explicitly identifying, whether through legislation or rulemaking, that the funding guidance in the code is "a floor" rather than a cap and restoring home retrofits into the program is another vital policy pathway for transiting the grid to 100 percent renewable energy generation at least-cost to ratepayers and actualizing the benefits of the varying equity directives included in the VCEA.

3. Policy considerations related to Virginia's Energy Efficiency Resource Standard (EERS).

- **Increasing Energy Savings And Electricity Sector Decarbonization With Expanded EERS For Utilities And Stronger Regulatory Enforcement:** There is a well-known direct tension between electric utilities' financial incentives to maximize profits, many of which in Virginia have actually been enshrined into state law outside of the regulatory environment, and the need to create unprecedented energy savings to meet energy efficiency targets and climate goals.[56] Along with enacting the state's first required, not voluntary, RPS, the VCEA requires IOU utilities to meet annual energy savings targets (i.e., by 2025 - 5 percent for Dominion Energy, 2 percent for Appalachian Power, respectively).[57] As included in the agency's modeling, IOUs completing the state's annual energy savings requirements by 2025 is essential for achieving electric sector decarbonization at least cost to ratepayers by 2050. To reach this goal, in the near term, the executive administration and the Commission must ensure that Dominion Energy, by its next

[52] HB 2330: Percentage of Income Payment Program and Fund; DHCD & DSS to adopt rules, etc., for adoption. See, "whole home retrofits."https://lis.virginia.gov/cgi-bin/legp604.exe?212+ful+HB2330

[53] HB 2330 (2021): "…The annual total cost of any programs implemented pursuant to clauses (i), (ii), and (iii) shall not exceed costs, including administrative costs, in the aggregate of (a) $25 million for any Phase I Utility or (b) $100 million for any Phase II Utility in any rate year in which such program costs are incurred…," https://lis.virginia.gov/cgi-bin/legp604.exe?212+ful+CHAP0308

[54]Wilson, Patrick. "SCC Approves Dominion Request to Recover Costs of Emission-Reduction Program." Richmond Times-Dispatch, August 4, 2021, https://richmond.com/news/state-and-regional/govt-and-politics/scc-approves-dominion-request-to-recover-costs-of-emission-reduction-program/article_ea3537db-3812-51ed-8c26-f4197c07d88f.html#tncms-source=login

[55] Cas No. PUR-2020-00169 (November 2020), Petition of Virginia Electric and Power Company, For approval of a rate adjustment clause, designated Rider RGGI, under § 56-585.1 A 5 e of the Code of Virginia, https://scc.virginia.gov/docketsearch/DOCS/4q3801!.PDF

[56] "Under traditional PUC regulation, a utility's throughput incentive (i.e., the incentive to maximize sales in order to increase profit), is in conflict with an aggressive pursuit of energy efficiency," https://www.epa.gov/sites/default/files/2016-03/documents/background_paper.pdf

[57] Virginia Clean Economy Act (2020), https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

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DSM/energy efficiency proceeding in 2022, meets the set of three requirements included in the Commission's final order for the utility's 2021 proceeding.[58]

In addition, the EERS carve-out for low-income, elderly, disabled individuals, and veterans is 15 percent of the energy efficiency funding requirement.[59] However, 16 percent of Virginians are 65 years and over; 23 percent are below double the federal poverty level; 12 percent have a disability; and 10 percent of those over 18 are civilian veterans.[60] While there is overlap between these populations, these numbers suggest that significantly more than 15 percent of efficiency funding should be allocated to these communities to ensure equitable access for the state's most vulnerable populations.

In the case that either utility does not meet the annual savings requirements of the EERS on-time, the appropriate agencies, General Assembly, and the current executive administration should hold firm on the statutory requirement to then deny any applications from utilities to further construct new fossil fuel-based generation facilities without achieving the required annual energy savings.[61] It is also important that the Commission retains the authority the regulatory agency needs to update and implement the annual energy savings requirements so as to keep energy costs affordable for customers as the VCEA is implemented and to meet the state's electricity sector decarbonization goals.

Increasing the annual energy savings requirements by at least two percent per year, as mentioned above, is an additional policy measure through the state's EERS that should be used to help close the gap between the decarbonization achievable through the VCEA and the goal of achieving zero emissions economy-wide by 2045.[62] With the inclusion of the EERS, Virginia now ranks 25th nationally and number-one in the U.S. Southeast for its energy efficiency policy and programs, with the 15th highest EERS nationwide according to the American Council for an Energy Efficient Economy (ACEEE) in 2020. ACEEE equated achieving Virginia'a EERS with avoiding greater than seven million metric tons of greenhouse gas emissions, and even more climate benefits and energy savings can be secured if the EERS measures are not only continued but strengthened by the state beyond 2025.[63]

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[58] Case No. PUR-2020-00274 (July 2021), For approval of its 2020 DSM Update pursuant to § 56-585.1 A 5 of the Code ofVirginia https://scc.virginia.gov/docketsearch/DOCS/5kmh01!.PDF (See pg 11-12)

[59] "At least five 15 percent of such proposed costs of energy efficiency programs shall be allocated to programs designed to benefit low-income, elderly, and or disabled individuals or veterans," https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

[60] U.S. Census Bureau. American Community Survey, 2019. https://data.census.gov/

[61] "the Commission shall not approve construction of any new utility-owned generating facilities that emit carbon dioxide as a by-product of combusting fuel to generate electricity unless the utility has already met the energy savings goals identified in § 56-596.2 and the Commission finds that supply-side resources are more cost-effective than demand-side or energy storage resources," https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

[62] "Extend and strengthen the Energy Efficiency Resource Standard beyond 2025,including a low-income specific standard, so electric monopolies equitably lower pollution and bills while avoiding building far costlier power generators, " https://vcnva.org/wp-content/uploads/2021/08/Slashing-Pollution-Energy-Bills-with-Virginias-Untapped-Resource-Energy-Efficiency.pdf

[63] Berg, W., S. Vaidyanathan, B. Jennings, E. Cooper, C. Perry, M. DiMascio, and J. Singletary. 2020. The 2020 State Energy Efficiency Scorecard. Washington, DC: ACEEE. aceee.org/research-report/u2011.

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Additional VCEA Considerations for the Agency

Comments on the agency's upcoming 2022 report; assessing the relationship between VCEA policy implementation and disproportionate impact in HEDCs[64]

Preventing disproportionate, adverse impacts on HEDCs in the implementation of the VCEA is a requirement of the statute.[65] [66] It is not uncommon, but considered best practice, for federal (and state) agencies to conduct disproportionate impact analyses to discern potential adverse implications of their planning, decision-making, regulatory actions, and financial investments on people-of-color, low-income families, and socially vulnerable communities. When the agency begins to prepare the scope and identify consultants for the upcoming report on the VCEA and disproportionate impact to HEDCs, please consider the following items:

1. **Natural gas; biomass generation:** Economic and health implications for HEDCs from natural gas and biomass generation remaining online, potentially until 2050 given protections included in the VCEA, especially considering the legacy of health, cultural, and environmental impacts of hog waste on historically black and poor working-class communities in North Carolina.[67]
2. **Siting renewable in HEDCs:** Policies and financing needed to ensure IOUs prioritize and equitably follow the VCEA's requirements for siting renewable generation in HEDCs.
3. **Climate gentrification:** How siting of renewable energy resources and changes to land use and zoning to mitigate climate damages can create and/or increase climate gentrification in HEDCs.[68]
4. **Just transition**: Policies and funding considerations for just transition support required from historically fossil-fuel industry dependent communities and workers; instituting long-term clean energy workforce training and hiring opportunities in HEDCs; also consider re-using fossil fuel brownfields as sites for clean energy development.
5. **RGGI**: Using the state's role in the RGGI to ensure the regional group increases cap goals to meet decarbonization goals on-time and at least-cost to electricity customers in HEDCs; prevent any emissions and co-pollutant shifting from the purchase and sell of carbon allowances across the region.
6. **Energy storage**: Value of incentives for energy storage used to charge the grid when grid emissions are low to ensure net climate and health benefits.
7. **End-of-life recycling and disposal**: End-of-life recycling and disposal of fossil-fuel based infrastructure, renewable resources, and energy storage in HEDCs; research related legacy pollution.

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[64] "5. That beginning September 1, 2022, and every three years thereafter, the Department of Mines, Minerals and Energy, in consultation with the Council on Environmental Justice and appropriate stakeholders, shall determine whether implementation of this act imposes a disproportionate burden on historically economically disadvantaged communities, as defined in § 56-576 of the Code of Virginia…," https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

[65] "The Commission shall ensure that the development of new, or expansion of existing, energy resources or facilities does not have a disproportionate adverse impact on historically economically disadvantaged communities," https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193

[66] "Disproportionate Effects - Term used in Executive Order 12898 to describe situations of concern where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples," https://www.epa.gov/environmentaljustice/ej-2020-glossary

[67] Newsome, Melba. "Turning Hog Waste into Biogas: Green Solution or Greenwashing?" Yale E360. Accessed October 5, 2021. https://e360.yale.edu/features/turning-hog-waste-into-biogas-green-solution-or-greenwashing.

[68] Ju, Shelia. "What Is Climate Gentrification?" NRDC, March 16, 2021. https://www.nrdc.org/stories/what-climate-gentrification.

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8. **Clarifying VCEA provisions**: Policy and financing options for expanding the VCEA's carve-outs for HEDCs, there should be more reliable funding available for workforce development beyond the penalties for non-compliance with the RPS (e.g., deficiency payments).
9. **Service disconnection protections**: Policies and financing options for enacting service disconnection protections in state law given the disproportionate impact of energy costs on utility customers before and during the ongoing COVID-19 health crisis.[69]
10. **Land justice; historic and cultural resources and economic conditions:** Research historic disproportionate impact of the fossil fuel infrastructure on the land, historic and cultural resources, and economic condition of HEDCs across generations; pursue opportunities to prevent potential and repair identified racial and economic inequities in the development and operation of renewable energy resources.

[69]Franklin, Marcus, Caroline Kurtz, Mike Alksnis, Lorah Steichen, and Chiquita Younger. Rep. LIGHTS OUT IN THE COLD: Reforming Utility Shut-Off Policies as If Human Rights Matter, 2017, https://naacp.org/resources/lights-out-cold.

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October 13, 2021

To Whom It May Concern:

My name is Nicole Riley, and I am the Virginia State Director for the National Federation of Independent Business (NFIB) representing over 6000 members from every industry sector across the Commonwealth. I am writing today to provide the small business perspective regarding clean energy reforms for the agency's decarbonization report.

Our members believe any decision to provide clean and reliable energy to Virginians, must be balanced with an approach that prioritizes affordability for the consumer and embraces all energy sources. As an opponent of the Virginia Clean Energy Act, our main concern was that increased costs would be passed along to Virginia consumers which the State Corporation Commission predicted would happen to the tune of over $800 in annual increases by 2030. Those increases are for residential customers – commercial customers like small businesses are likely to see even bigger increases.

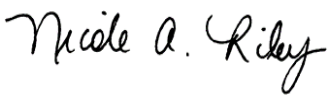
In fact, Virginia ratepayers including small businesses are already experiencing increases in their energy bills driven by recent General Assembly decisions. There is the RGGI tax now imposed on every customer's bill along with a small monthly tax to set up the new low-income power bill subsidy. When these subsidies begin to flow, that second electricity tax will balloon into a much larger amount.

This means it is critical that if Virginia continues to transition to clean energy sources, we should not be sacrificing reliable energy sources and thousands of jobs by halting the operation of carbon-emitting electric generating units. Grid diversification is key to providing reliable energy throughout the Commonwealth and is why, as Virginia electric utilities are in the process of building our clean energy capacity, we continue and should continue to utilize a mix of nuclear, natural gas, solar, coal, hydroelectric, and wind to power our homes and businesses.

Nuclear energy which provides nearly one-third of Virginia's electricity, has operated safely for decades, is a key source of power for the Navy, and supports thousands of jobs. Further, there are nearly 3,000 coal workers in Virginia and innovative technologies are allowing for cleaner burning of coal and coal waste. Natural gas and oil also employ 125,000 Virginians and adds billions to our economy. Similarly, offshore wind is set to create thousands of jobs in the commonwealth as we become an industry leader along the East Coast.

Together, these diverse energy sources are ensuring that Virginians have the power needed to keep their lights on at affordable rates while protecting jobs and keeping our economy strong.

Sincerely,



Nicole A. Riley, Virginia State Director

Recommendations for Virginia Achieving Carbon-Free Electric Generation by 2045

Nuclear Energy Institute

October 8, 2021

In April 2020, Virginia Governor Ralph Northam signed in to law the Clean Energy Economy Act. Within that Act, the Virginia Department of Energy is charged to provide a report with recommendation on how to reach decarbonization goals with the least cost to ratepayers.

Nuclear Energy Facility	Company	Location	Capacity (MW)	Capacity Factor (%)[1]
1 North Anna 1	Dominion	Mineral	948	96.1
2 North Anna 2	Dominion	Mineral	944	94.9
3 Surry 1	Dominion	Surry	838	91.2
4 Surry 2	Dominion	Surry	838	98.7
		State Totals	3,568	95.2

Source: U.S. Energy Information Administration

[1] Capacity factor three-year average is electricity produced compared to the maximum that could be produced and is calculated based on generation in 2017, 2018 and 2019.

§ 10.1-1308 of the Code of Virginia, as amended by this act, the Secretary of Natural Resources and the Secretary of Commerce and Trade, in consultation with the State Corporation Commission and the Council on Environmental Justice and appropriate stakeholders, shall report to the General Assembly by January 1, 2022, any recommendations on how to achieve 100 percent carbon-free electric energy generation by 2045 at least cost for ratepayers. Such report shall include a recommendation on whether the General Assembly should permanently repeal the ability to obtain a certificate of public convenience and necessity for any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity. Until the General Assembly receives such report, the State Corporation Commission shall not issue a certificate of public convenience and necessity for any investor-owned utility to own, operate, or construct any electric generating unit that emits carbon as a by-product of combusting fuel to generate electricity.

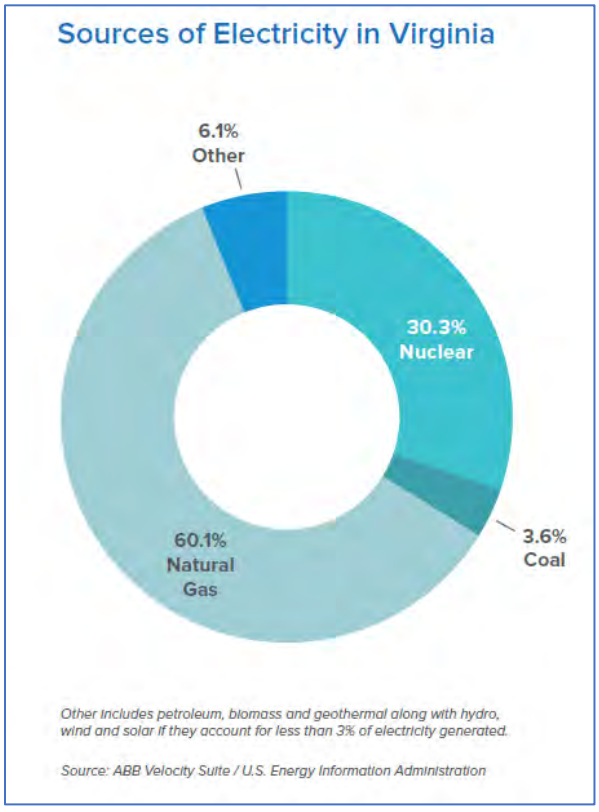
Nuclear energy should have a prominent place alongside growing shares of wind and solar production in the Virginia plan to achieve 100% carbon-free generation. Nuclear energy is far and away Virginia's largest zero-carbon generating resource, and the technology will remain an important source of clean energy and well-paying jobs for decades to come.

Nuclear Energy in Virginia

The four commercial nuclear power reactors in Virginia are the source of more than 30% of Virginia's electricity and more than 95% of the state's carbon-free generation. Virginia consistently ranks among the top ten U.S. states in annual nuclear energy generation.

Two nuclear reactors are located at each of two Dominion Generation power stations – the North Anna and Surry stations – that together employ more than 2,000 Virginians. Units 1 and 2 at the Surry station were recently approved by the U.S. Nuclear Regulatory Commission (NRC) to operate until 2052 and 2053, respectively. Units 1 and 2 at the North Anna station are licensed to operate until 2038 and 2040, respectively, and have applied to the NRC for approval for twenty more years of operation.

Virginia's leadership in nuclear energy extends well beyond electricity generation. As the home of leading nuclear technology companies like Bechtel, BWXT, Framatome, Lightbridge, MPR and Newport News Shipbuilding, and with the growing presence of GE-Hitachi, Virginia is well poised to capture a significant share of the market for a next-generation of nuclear technology manufacturing, construction, service and supply. And Virginia's educational institutions, including Liberty University, Virginia Commonwealth, the University of Virginia and Virginia Tech, are conducting world-class research and developing the next generation of nuclear leaders.



Nuclear power is the workhorse of our zero-carbon fleet

- Dominion Energy

https://www.dominionenergy.com/ourpromise/clean-energy#

Preserving Existing Nuclear Generation

The first step in meeting Virginia's goal to eliminate power sector emissions by mid-century is to preserve the long-term operation of the nuclear plants that provide over 95 percent of the state's carbon-free power.

Nuclear units apply for licenses from the Nuclear Regulatory Commission to ensure they will continue to operate safely. All plants begin with a 40-year license and almost every unit in the U.S. – including those in Virginia –received a license renewal that have allowed them to operate for an additional 20 years. For this nuclear foundation to continue through mid-century, Virginia's four nuclear power reactors will need to receive a subsequent license renewal (SLR) to operate beyond 60 years. An SLR will only be granted if the units can demonstrate

that they are well-maintained and being operated safely, as determined by the stringent regulatory authority of the Nuclear Regulatory Commission. Dominion has successfully sought an SLR for the Surry 1 and 2 reactors, and has applied for SLR for North Anna 1 and 2. ***Virginia should ensure that the policies governing the electric sector encourage the continued capital investments in these nuclear units that will enable them to make any component upgrades or other improvements that will be necessary to receive an SLR.***

In supporting the long-term operation of its nuclear plants, Virginia will join a growing list of state governments that have chosen to take action to preserve nuclear power generation. New York, Illinois, Connecticut and New Jersey have all implemented policies, including the creation of zero-emission credits, that have enabled nuclear plants to remain in operation.

In taking action to ensure nuclear energy remains part of the portfolio to reduce carbon emissions, Virginia will be heeding the counsel of a broad range of experts that have called attention to nuclear energy's vital role in this journey. The Intergovernmental Panel and Climate Change, the OECD's International Energy Agency, the World Resources Institute, the Center for Climate and Energy Solutions, and the Union of Concerned Scientists are among the groups that have called for the need to include nuclear energy as a component of a cost-effective carbon reduction strategy. As stated by the OECD IEA in a 2019 report, "Taking nuclear out of the equation results in both higher emissions and higher electricity prices for consumers."[i]

Virginia is a Leader in Nuclear Energy Technology

Virginia is well poised to capture a significant share of the market for a next-generation of nuclear technology manufacturing, construction, service and supply through industry-leading firms including:

Since 1898, Bechtel has helped customers complete more than 25,000 projects in 160 countries on all seven continents that have created jobs, grown economies, improved the resiliency of the world's infrastructure, increased access to energy, resources, and vital services, and made the world a safer, cleaner place.

BWX Technologies, Inc.'s mission to be a trusted provider of critical components and services to the United States government and commercial customers drives everything we do. From the Naval Nuclear Propulsion program to research test reactors for our national labs and complex operations management, BWXT's commitment proudly lives on through our talented workforce, state-of-the-art technologies and innovative solutions.

Framatome's mission is to be the leading designer and supplier of nuclear steam supply systems, equipment, services and fuel, continuously striving to reach the highest levels of performance and

GE Hitachi Nuclear Energy is a world-leading provider of advanced reactors, fuel and nuclear services. Established in 2007, GEH is a global nuclear alliance created by GE and Hitachi to serve the global nuclear industry. The nuclear alliance executes a single, strategic vision to create a broader portfolio of solutions, expanding its capabilities for new reactor, fuel and service opportunities.

Lightbridge is an advanced nuclear fuel technology company. The Company is developing Lightbridge Fuel™, a proprietary next generation nuclear fuel technology for current and future reactors, which enhances economics, proliferation resistance, and safety of nuclear power, operating about 1000 °C cooler than standard fuel.

MPR accomplishes challenging tasks that benefit society in many ways. We bring exceptional value to our clients by committing to their success, working collaboratively, fulfilling our promises, and exceeding their expectations. We achieve on their behalf through engineering excellence, innovation, and creativity, carried out by highly talented professionals working in a premier environment.

Newport News Shipbuilding is the sole designer, builder and refueler of U.S. Navy aircraft carriers and one of two providers of U.S. Navy submarines. With approximately $4 billion in revenues and more than 25,000 employees, we are the largest industrial employer in Virginia and the largest shipbuilding company in the United States.

Creating the Opportunity for New Nuclear Construction

Energy analysts have demonstrated that an affordable, reliable, decarbonized electric grid will require significant build-out of three classes of carbon-free energy resource: "fuel saving" resources like wind and solar that don't require a fuel to operate; "fast burst" resources like batteries that can respond to short-term fluctuations on the grid; and "firm low-carbon" generation like nuclear energy, geothermal energy, or fossil fuels with carbon capture.[ii] As shown in Figure 1, a 2018 study of the costs of decarbonizing the northern electric system found that the availability of firm, low-carbon resources like nuclear energy would reduce total system costs by 10 to 62 percent in zero-carbon scenarios.

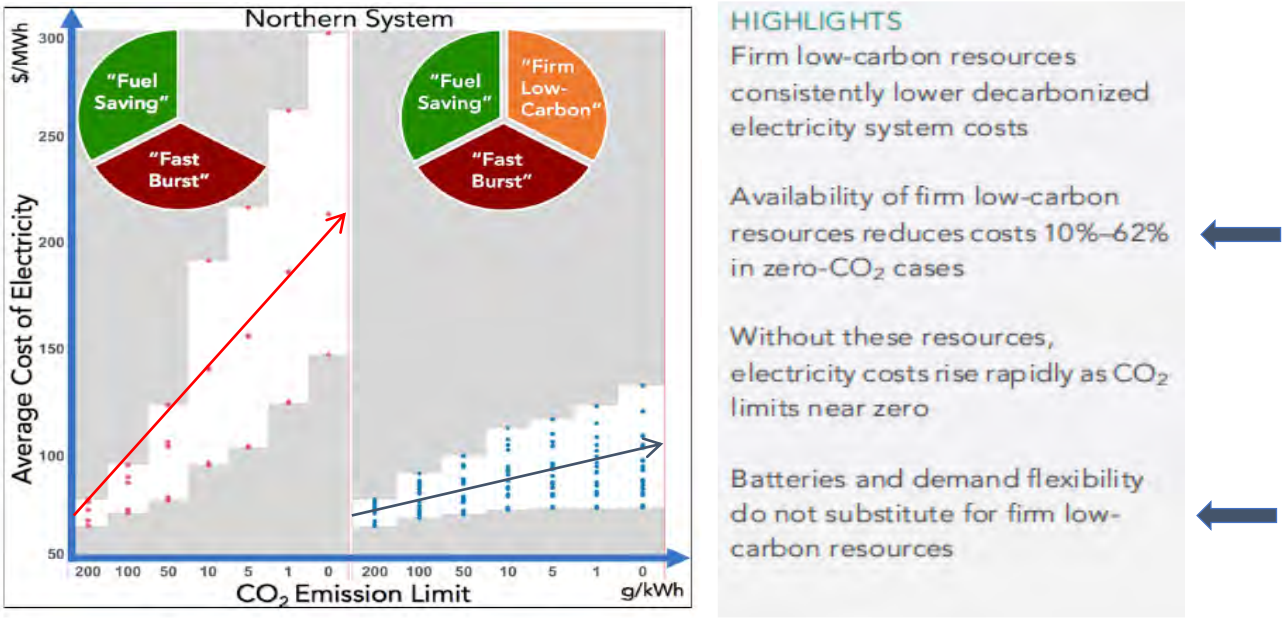


Figure 1: System-wide cost savings from including firm, zero-carbon generation in a decarbonizing electric system; Source: Sepulveda et al., Joule 2, 2403–2420, November 21, 2018; https://doi.org/10.1016/j.joule.2018.08.006

A recent study of a 100% decarbonized electric grid in the Pacific Northwest further proves this point; it found that more than $8 billion per year could be saved by both retaining the existing nuclear-powered Columbia Generation Station (CGS) and by adding new Small Modular Reactors (SMRs) to complement existing and new hydro, wind and solar resources (see figure 2).[iii] Continued investment in technology development and

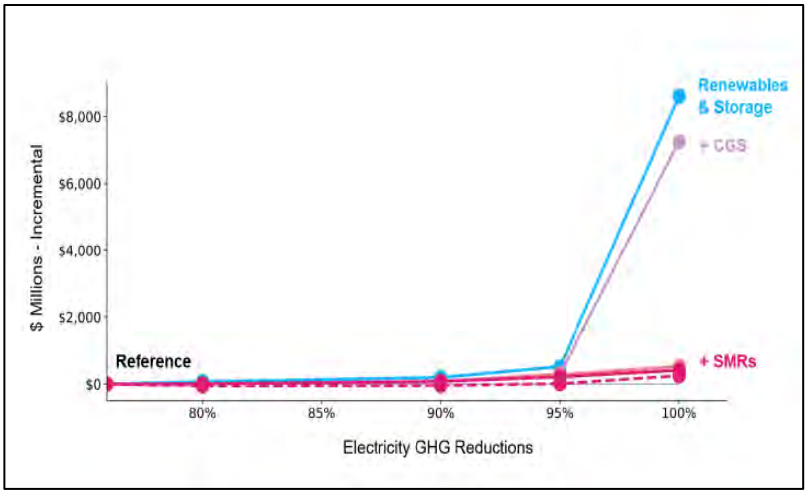


Figure 2: Annual systemwide cost savings from including existing and new nuclear on the Pacific Northwest grid under decarbonization scenarios

demonstration – coupled with smart federal and state clean energy policies – is needed to ensure all three classes of resource are available in the quantities and on the timelines required.

Looking specifically at nuclear energy, there are dozens of advanced reactor and nuclear technology developers in the U.S. – including several in Virginia – that are working on new and innovative reactor designs ranging in size from a few megawatts to more than 1,000 megawatts. These designs specifically address the economic and safety concerns that have led some to question nuclear energy's future viability as a clean energy resource. And this new generation of designs will enable more than just electricity production at large central facilities. It will help provide carbon free, resilient and reliable energy to remote locations that are currently using diesel and it will enable the replacement of retiring coal facilities utilizing the existing infrastructure (and in doing so, preserve or increase the jobs in the local community).

To take maximum advantage of these new nuclear energy technologies, Virginia should enact market-stimulating policies for nuclear energy and the full range of carbon-free energy resources. A recent study from MIT demonstrated the role that such market-stimulating policies – including federal tax credits and state renewable portfolio and clean energy standards – have played in attracting the private-sector investment needed to drive down costs and achieve widespread commercialization of solar power.[iv] Virginia should ensure that its clean energy policies allow for new nuclear construction in the decades to come if needed to ensure reliable, affordable, carbon-free electricity generation for Virginians. ***Specific policy approaches could include:***

- ***Valuing Carbon-Free Electricity Generation – Virginia's decision to join the Regional Greenhouse Gas Initiative is a positive step that will accelerate the clean energy transition and will more fully value nuclear energy generation for its carbon-free attribute. The following additional options are available to states to incentivize new carbon-free generating capacity:***
    - ***Zero Emissions Credits – Similar to programs adopted by Illinois and New York for operating nuclear facilities. Zero Emissions Credits (ZEC) for new nuclear, and other carbon-free sources, would provide a payment at a set rate for every megawatt-hour of carbon-free electricity generated. The rate would be set based on the State's calculation for the environmental and health benefits of avoided carbon emissions.***
    - ***Carbon-Free or Low-Carbon Standards – Numerous States have renewable portfolio standards that require utilities to sell a specified percentage or amount of renewable electricity. Nuclear generation could be included in a revision to these standards to incentivize a diverse carbon-free or low-carbon portfolio that benefits from fuel diversity.***
    - ***Carbon Tax or Cap and Trade – State taxes on carbon emissions, similar to those in British Columbia and Alberta, are a mechanism to transfer the economic burden of environmental costs of carbon directly to the generating source. Cap and trade policies would also create a price for carbon and a system for rewarding low-carbon generation.***
- ***Lowering Financing Costs - The following options are available to help reduce the overall cost of the new nuclear facility by helping to reduce financing costs:***

- ***Advanced Cost Recovery – Also known as Construction Work in Progress (CWIP), States with regulated utilities may enact policies to allow a utility to collect costs from customers during construction, similar to Georgia, South Carolina and Florida. CWIP reduces the overall amount needed to finance a project and may reduce the total project costs that eventually are included in the customer rate base.***
- ***Cost Recovery of Advanced Nuclear Siting – In order to increase the deployment of advanced nuclear reactors, allow nuclear developers to apply to the State Corporation Commission for the recovery of costs associated with the siting and permitting of new nuclear facilities.***
- ***Loan Guarantees – U.S. Federal loan guarantees (or direct Federal Financing Bank loans as used by the Vogtle project) are available to new nuclear facilities and help reduce the borrowing rates. States could supplement the Federal loan guarantee program by helping the owner with the program costs. In cases where Federal loan guarantees are not available or suitable for a project, States could provide loans or loan guarantees.***
- ***Integrated Resource Plan (IRP) planning horizons could be extended to better evaluate the difference in lifetimes of generating assets. Nuclear facilities typically take about ten years to build and operate and have lifetimes of 60-80 years. Other generating assets often have much shorter durations to construct and shorter lifetimes. A 20-year financial analysis period would not provide a consistent basis for comparison, since nuclear assets have many decades of life remaining at the conclusion of the financial analysis period while other assets may be nearing the end of their useful lives.***

- ***Providing Tax Incentives - The following are examples of some types of credits available to states:***
  - ***Production Tax Credit – Based on the generation and sale of electricity.***
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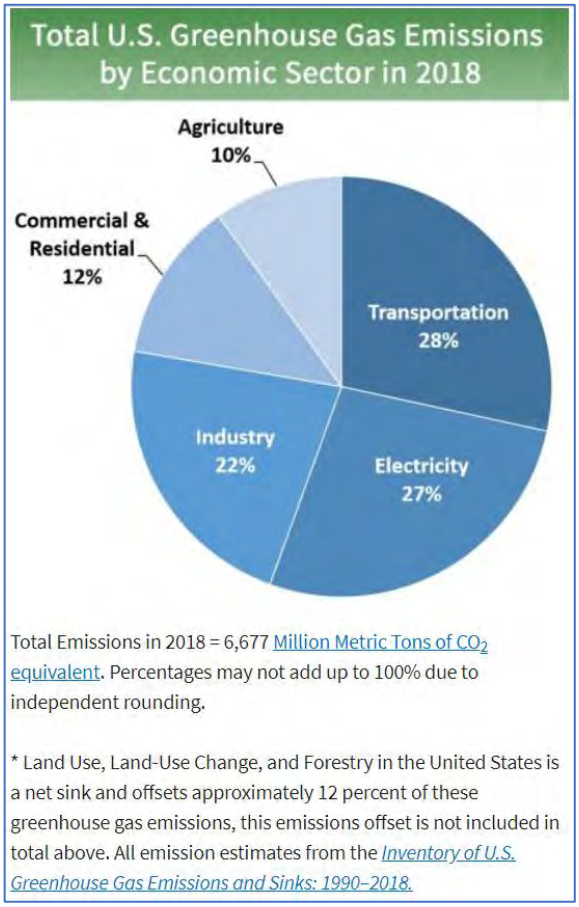
It's also important to note that, even if nuclear, solar and wind successfully partner to create a carbon-free electricity system, Virginia will still have work to do if it wants to decarbonize its energy system. That's because electricity only accounts for about thirty percent of nation-wide carbon emissions. To fully address the carbon emissions issue, reductions in power sector emissions must be complemented by dramatically reduced emissions from transportation and industrial use; these sectors account for about half of the greenhouse gas emissions from U.S. energy use[v].

There are two strong options to achieve transportation and industrial emissions goals. First would be to rely on this carbon-free electricity to provide more of the energy to move people and produce goods. Second is to produce carbon-free substitutes that can take the place of fossil fuels. We will need thoughtful policies to encourage the economic innovation that will transform how energy is used to drive economic growth and create jobs for the future.

Decarbonizing the transportation sector require moving away from fossil fuels – including gasoline, diesel and natural gas – and increasing the use of low-carbon fuels. The greatest potential for decarbonizing the transportation sector comes from using electricity or hydrogen generated from zero-carbon sources like nuclear reactors, wind turbines, and solar panels.

Nuclear energy can play a significant role in providing the carbon-free electricity needed to power a growing fleet of electric vehicles. To ensure maximum benefit from the increased electrification of passenger cars and other vehicles, ***Virginia should adopt policies that incentivize the use of zero-carbon generation – including nuclear energy – to power electric vehicle charging infrastructure.***



<u>Creating Jobs through Nuclear Innovation, Exports, and Workforce Training and Development</u>

Virginia's nuclear energy companies are leaders in technology innovation, manufacturing and construction. By preserving existing nuclear power plants and creating a policy framework that could allow for construction of a new generation of nuclear energy facilities, Virginia can strengthen its position as a nuclear energy leader and add to the thousand of well-paying nuclear industry jobs in the state. Virginia is also home to world-class universities and community colleges that offer education and training programs that can prepare the next generation of nuclear energy leaders.

Nuclear energy manufacturing, supply and service jobs are a particularly ripe opportunity for the state. By virtue of both a significant commercial nuclear energy sector and Virginia's deep connections to the Naval Nuclear Propulsion Program – including major

facilities in Portsmouth and Newport News – the state is home to world-class nuclear facilities with a workforce to match. In particular, developers of next-generation nuclear energy systems are looking to learn from and replicate the long track record of success in naval vessel fabrication and construction. With the right policies, Virginia can position itself to attract a significant share of the market for nuclear energy system manufacturing, construction, service and supply.

The potential size of the market for new nuclear energy systems is nothing short of impressive. A forthcoming report by the consultancy UxC analyzes global and regional nuclear power outlooks over the period to 2050 based on the scenarios presented in the October 2018 report of the United Nations' Intergovernmental Panel on Climate Change (IPCC)[vi]. UxC used the pathways presented in the IPCC report to analyze the types of reactor technologies that could be deployed in various regions through 2050 to keep global temperatures at no higher than 1.5°C above pre-industrial levels. The analysis finds that "the 30-year cumulative total for U.S. nuclear market revenues could range between $1.3 trillion and $1.9 trillion. U.S. suppliers will have numerous opportunities to expand their market presence, including in new reactor construction projects (large, small modular, and advanced designs), maintaining and fueling the global fleet of reactors, as well as decommissioning aging reactors."

The state of Virginia stands to reap huge benefits from capturing a significant share of the domestic and global markets for nuclear energy products and services. Today's nuclear energy sector is responsible for approximately 100,000 well-paying jobs, and a typical nuclear power plant employs 500 to 1,000 workers.[vii] According to a 2018 study by Oxford Economics, the nuclear sector is the highest paying industry in the electric power generation sector.[viii] Nuclear power plants and manufacturing facilities have become the economic engines for the rural areas where they are often located, offering a large number of high paying jobs and the large local tax base and economic activity that comes with them.

Today, approximately 70,000 people are employed in nuclear power generation and fuels production, with the balance employed in fields such as construction, decommissioning, regulation, research and development. This number has fallen slightly in recent years as about six percent of U.S. nuclear energy generation has been shuttered, but could be poised for a rebound as new nuclear plants are constructed. This would be great news for our next generation of nuclear energy workers; the average mid-wage worker in the nuclear industry earns 22% more per hour than the average mid-wage worker in the coal industry and 25% more than a worker in the natural gas industry[ix]. The pay differential with solar installers is even more dramatic; the average solar panel installer earns less than half per hour than the average mid-wage worker in the nuclear industry[x].

Virginia's nuclear energy sector – both existing firms and educational institutions as well as companies that could be attracted into the state – have the workforce, the facilities, and the reputation to win a substantial share of the nuclear energy market opportunity. ***Policies that would best position the state to compete for and win this business include:***

- ***Training – Virginia could develop or bolster existing State University and Community College programs to train nuclear facility workers in areas such as radiation protection, maintenance, chemistry and engineering. Virginia should also ensure support is available for apprenticeships and other training programs to help meet present and future workforce needs.***

- ***Innovation Grants – Virginia could provide funds directly to the developers of advanced technology and manufacturing.***
- ***University R&D – The state could provide funds that support State University R&D that is directly applied to the development of advanced technology and manufacturing.***
- ***Siting – Virginia could provide funds to study the feasibility of siting new nuclear facilities.***
- ***Transportation improvements -- Virginia could enhance the appeal of particular locations by implementation of transportation improvements such as rail spurs, roads, barge access, and other improvements that make construction and operation safer and more economical.***

Summary of Recommendations

Nuclear energy is by far the largest source of carbon-free generation in Virginia and across the U.S. To ensure nuclear energy is available over the long-term to complement wind, solar, and energy storage in a reliable, affordable, carbon-free electric system, the Nuclear Energy Institute recommends that the State of Virginia:

- ***Ensure that the policies governing the electric sector encourage the continued capital investments in these nuclear units that will enable them to make any component upgrades or other improvements that will be necessary to receive an SLR.***
- ***Enact market-stimulating policies for nuclear energy and the full range of carbon-free energy resources - specific policy approaches could include:***
    - ***Valuing Carbon-Free Electricity Generation - The following options are available to states to incentivize new carbon-free generating capacity:***
        - ***Zero Emissions Credits – Similar to programs adopted by Illinois and New York for operating nuclear facilities. Zero Emissions Credits (ZEC) for new nuclear, and other carbon-free sources, would provide a payment at a set rate for every megawatt-hour of carbon-free electricity generated. The rate would be set based on the State's calculation for the environmental and health benefits of avoided carbon emissions.***
        - ***Carbon-Free or Low-Carbon Standards – Numerous States have renewable portfolio standards that require utilities to sell a specified percentage or amount of renewable electricity. Nuclear generation could be included in a revision to these standards to incentivize a diverse carbon-free or low-carbon portfolio that benefits from fuel diversity.***
        - ***Carbon Tax or Cap and Trade – State taxes on carbon emissions, similar to those in British Columbia and Alberta, are a mechanism to transfer the economic burden of environmental costs of carbon directly to the generating source. Cap and trade policies would also create a price for carbon and a system for rewarding low-carbon generation.***
    - ***Lowering Financing Costs - The following options are available to help reduce the overall cost of the new nuclear facility by helping to reduce financing costs:***
        - ***Advanced Cost Recovery – Also known as Construction Work in Progress (CWIP), States with regulated utilities may enact policies to allow a utility to collect costs from customers during construction, similar to Georgia, South Carolina and Florida. CWIP reduces the overall amount needed to finance a***

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- ***Adopt policies that incentivize the use of zero-carbon generation – including nuclear energy – to power electric vehicle charging infrastructure***
- ***Implement workforce development policies that would best position the state to compete for and win new nuclear sector business:***
  - ***Training – Virginia could develop or bolster existing State University and Community College programs to train nuclear facility workers in areas such as radiation protection, maintenance, chemistry and engineering. Virginia should also ensure support is available for apprenticeships and other training programs to help meet present and future workforce needs.***
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- ***Transportation improvements -- Virginia could enhance the appeal of particular locations by implementation of transportation improvements such as rail spurs, roads, barge access, and other improvements that make construction and operation safer and more economical.***

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[i] OECD IEA, https://www.iea.org/reports/nuclear-power-in-a-clean-energy-system
[ii] https://www.cell.com/joule/pdf/S2542-4351(18)30386-6.pdf
[iii] Energy & Environmental Economics, *Pacific Northwest Zero-Emitting Resources Study, Executive Summary*, January 29, 2020 – https://www.energy-northwest.com/Documents/E3%20Study%20Executive%20Summary%20final.pdf
[iv] https://www.sciencedirect.com/science/article/pii/S0301421518305196?via%3Dihub
[v] U.S. Environmental Protection Agency - https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions
[vi] IPCC Special Report "Global Warming of 1.5 C" - https://www.ipcc.ch/sr15/
[vii] https://www.nei.org/advantages/jobs
[viii] *Nuclear Power Pays: Assessing the Trends in Electric Power Generation Employment and Wages*, Oxford Economics – https://www.oxfordeconomics.com/recent-releases/nuclear-power-pays-assessing-the-trends-in-electric-power-generation-employment-and-wages
[ix] *2020 U.S. Energy and Employment Report*, p. 108, 113 and 119 - https://www.usenergyjobs.org/
[x] https://www.payscale.com/research/US/Job=Solar_Energy_System_Installer/Hourly_Rate

POWER FOR TOMORROW

October 12, 2001

Greetings:

On behalf of Power for Tomorrow (PFT), a Virginia-based nonpartisan organization advocating to ensure consumers are protected through sensible regulation of electric companies, this comment is in support of grid diversification and the continued use of carbon and non-carbon emitting technologies by investor-owned utilities as the commonwealth transitions to a clean energy future.

The Virginia Clean Economy Act (VCEA) will create environmental and economic benefits for generations to come. But to maintain reliable and affordable energy for all Virginians, it is critical that as the VCEA is enacted, the commonwealth maintains its commitment to sources of energy production that are both proven and cost-effective.

Currently, Virginia's electricity is powered by a mix of natural gas, coal, nuclear, hydroelectric, and non-hydroelectric renewables. Natural gas and nuclear provide the majority of electricity for the commonwealth. While Virginia makes an aggressive push towards renewables, to maintain reliable and affordable energy for all ratepayers, it is essential to sustain our natural gas and nuclear assets. Therefore, PFT strongly encourages the commonwealth to continue to grow Virginia's renewable capacity through the Coastal Virginia Offshore Wind (CVOW) project and solar expansion.

PFT advocates for policies that protect customers, ensure reliable access to affordable power, promote a clean energy future, and spur innovation. The VCEA is an important and innovative proposal. But the facts are clear: halting the use of nuclear, natural gas and other energy sources too soon, would mean that when demand spikes for energy during intense bouts of hot or cold, that electricity in the commonwealth could be both unreliable and more expensive (resulting in higher utility bills) due to a scarcity of power.

Sincerely,

Gary Meltz
Executive Director, Power for Tomorrow

October 9, 2021

Submitted electronically to modeling@dmme.virginia.gov

John Warren, Director
Virginia Energy
Washington Building, 8th Floor
1100 Bank Street
Richmond, Virginia 23219

Re: Comments on "Getting to Carbon-Free Electric Generation at Least Cost to Virginia Ratepayers."

COMMENTS OF THE SIERRA CLUB

We submit these comments on behalf of the Sierra Club's approximately 20,000 members across the Commonwealth of Virginia. The Club is dedicated to exploring, enjoying, and protecting the wild places of the Earth; to practicing and promoting the responsible use of the Earth's resources and ecosystems; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out those objectives. Our members live within the airsheds, watersheds, and other areas affected by the operation of fossil-fueled generation facilities. The Sierra Club also has an interest in promoting energy efficiency and distributed renewable energy while avoiding disproportionate and unreasonable burdens on low-income Virginians. Not only are these organizational interests of the Sierra Club, they are legislative policies encoded in the Commonwealth's Energy Policy and elsewhere in Virginia law.[1]

1 *See*, *e.g.*, Virginia Code §§ 67-101, 67-102; 2007 Acts of Assembly, Chapter 933 (SB 1416).

The Virginia Clean Economy Act ("VCEA") creates an important framework on which the Commonwealth can build to enable our utilities to quickly begin providing customers with carbon-free electricity, as dictated by the dire nature of the climate emergency, at the least cost to ratepayers. The VCEA directed the Secretaries of Natural Resources and Commerce and Trade, in consultation with the State Corporation Commission and the Council on Environmental Justice to report to the General Assembly by January 1, 2022, with a recommendation on *how* to achieve 100% carbon-free electric generation by 2045, at least cost to ratepayers.[2] On September 9, 2021, Virginia Energy, DEQ and other research partners presented their "Getting to Carbon-Free Electric Generation at Least Cost to Virginia Ratepayers," which included a presentation of the modeling results.

The Sierra Club attended the virtual presentation and reviewed the PowerPoint slides and have numerous concerns regarding the transparency of the modeling and how the results actually show a least cost path forward for ratepayers. Synapse Energy Economics, on behalf of the Sierra Club, performed similar modeling for Virginia Electric and Power Company's ("Dominion Energy Virginia") 2020 Integrated Resource Plan, and came to very different results, to the tune of ten million tons *less* carbon emissions by 2035. We respectfully request that Virginia Energy delay its final report to the General Assembly in order to correct the issues in its modeling, as detailed below, and share the modeling inputs and results with stakeholders and the public.

Lack of Transparency Behind the Modeling Makes it Impossible to Substantively Comment on the Presentation

While the Sierra Club appreciates the time and effort that goes into modeling, having just engaged an expert to conduct similar modeling for Dominion territory, we are disappointed in the lack of transparency surrounding the modeling efforts. This lack of transparency results in the Sierra Club being unable to provide substantive comments on the modeling inputs and results. Virginia Energy asked stakeholders, at the conclusion of the September 9th presentation to opine on the following questions:

- Do we have the key assumptions right that get us to these results?

2 2020 Acts of Assembly, Chapter 1193, Section 6 (HB 1526).

- What potential additional policy measures do we consider to close the gap? When should additional policies be considered?
- What additional matters should the report drafters take into account?

First, Sierra Club does not know all of the assumptions that went into the model, so we cannot comment on whether Virginia Energy included all the necessary key assumptions. While Slide 13 of the September 9th presentation lists the inputs into the model, such as "existing power plants" or "planned new investments;" it fails to identify what the existing power plants are and what planned new investments it included in its modeling. Based on the Q&A segment of the September 9th presentation, it became clear that the Chickahominy merchant gas plant was included (presumably as a planned new investment). However, the real question is *why* was the Chickahominy merchant plant included when this modeling is supposed to identify the *least cost path to carbon-free electric generation*. If you are looking at the least cost pathway for ratepayers, you should not (a) include a new, not-yet built fossil-fuel fired plant that will emit carbon (and other pollutants) for decades, nor (b) include a merchant plant at all, since ratepayers do not directly pay for their electricity through a merchant plant. This is irrespective of the fact that it is uncertain if the Chickahominy Plant will even be constructed. Due to the disclosure of this plant being included in the model, it begs the question regarding what other "planned" investments were included in this analysis; without a list, stakeholders cannot properly comment.

It is also unclear from the presentation, how much of the high demand sensitivity depicted on slide 19 is caused by building electrification versus data center growth. It is also unclear if there were various modeling sensitivities of electric vehicle growth through 2045. In addition, because the inputs were not provided to stakeholders, we do not have access to the actual numbers behind the estimated load growth, electric vehicle growth, or building electrification. All of these varying assumptions (and their associated modeling sensitivities) will impact how much generation is needed in the future and how that generation can be met through clean energy versus energy efficiency or demand side management.

Another key data point that was not disclosed relates to existing coal plants and whether any of them were allowed by the model to retire sooner than Dominion's or Appalachian Power's proposed retirement dates in their most recent Integrated Resources Plans. Slide

15 of the September 9th presentation, power plant generation, states that "coal falls to very low levels in Virginia by 2030." On Slide 16, power plant capacity, existing coal plants appear to be online through 2040. It is already common knowledge that the existing coal plants are uneconomic and getting worse. Dominion's own retirement analysis from 2020 showed that virtually *all* of its remaining coal plants are losing millions of dollars:

Table 1: Dominion 10-year NPV Results, 2020-2029[3]

Unit	NPV ($Million)
Chesterfield 5-6	($78)
Clover	($21)
Mount Storm	$100
Virginia City	($472)
Yorktown 3	($18)

Not only is this bad for ratepayers, but retiring these old, uneconomic coal plants early will save ratepayers money and significantly decrease carbon emissions, as explained in more detail below, on page 7.

A third major flaw is the apparent focus solely on electric generation costs, without considering the enormous costs, including health costs, to the public from continued emissions of CO_2 and other pollutants from fossil-fuel fired generation. Early retirements of fossil-fuel plants, particularly coal-fired plants, will significantly reduce the total costs to the public, which should be the goal. These are real costs and they are huge. The social costs of carbon have been documented by the Federal government and are readily available as a reasonable approximation of the public costs of continued pollution from fossil fuels—although those estimates of costs are being reviewed and are expected to be raised later this year. Significantly, in H2227 (pertaining to building energy efficiency standards), the 2021 General Assembly made clear that costs of energy use include pollution costs, which the modeling should incorporate.[4]

3 *See* Direct Testimony of Rachel Wilson on Behalf of the Sierra Club, public version, In re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Virginia Code §56-597, et seq., Docket No. PUR-2020-00035, Table 5 at 17, attached as Exhibit 1 (excluding exhibits). For a full copy of Ms. Wilson's testimony, please see https://scc.virginia.gov/docketsearch/DOCS/4p2501!.PDF.

4 2021 Special Session I Acts of Assembly, Chapter 425, (H2227).

Another flaw is an overwhelming lack of information. If this modeling is supposed to show a least cost path for ratepayers to carbon-free by 2045, then:

(1) why didn't you model out to 2045?
(2) why don't the modeling results show how to get to zero carbon emissions by 2045?
(3) how are you going to close the 10-million-ton gap between 2040 and 2045?
(4) what are the actual costs of this particular path forward and is it least cost?

The last question, regarding cost, is an important one. The entire purpose behind the report to the General Assembly is to identify a least cost path forward, which necessarily implies that there is a cost associated with the path that is recommended, and that other paths were also considered. Did Virginia Energy and its modelers look at other paths to get to zero carbon emissions, or was this the only one? If you did consider other paths with differing modeling results, where are those results and why aren't they available for stakeholder comment? This lack of information and transparency on a key component of the modeling is frustrating and it impedes the public comment process.

Lastly, the September 9th presentation stated that Virginia Energy would provide additional opportunities for stakeholder input on the modeling results, yet the September 9th presentation was our only opportunity. This is neither transparent nor helpful to stakeholders or to the public in analyzing whether Virginia Energy has indeed put forward a least cost path to carbon-free electric generation.

Energy Efficiency Is Critical to Meeting the 2045 Carbon-Free Requirement

It is our understanding from the presentation that energy efficiency was not included or accounted for as a supply-side resource. The VCEA included energy efficiency targets for utilities, including 5% energy savings for Dominion and 2% energy savings for Appalachian Power Company, using 2019 as the baseline, with additional energy efficiency targets being set by the State Corporation Commission starting in 2026.[5] As the American Council for an Energy-Efficient Economy ("ACEEE") stated in its recent report, these VCEA energy efficiency targets alone are expected to save "an estimated seven

5 Va. Code § 56-596.2 B.

million metric tons of GHD emissions over four years."[6] At a minimum, the modeling team should have included these initial energy efficiency requirements in its modeling and then assumed a similar trajectory going forward beyond 2025, which would have aided in the decrease of carbon emissions in the modeling results and decreased costs to ratepayers. In addition, Virginia Energy should include a sensitivity that assumes more aggressive energy efficiency standards and programs that would reduce the cost of achieving carbon-free electricity by 2045.

Energy Efficiency is critical to meeting the 2045 carbon-free electric generation requirement at the lowest possible cost. As articulated by the ACEEE, "without clear inclusion of energy efficiency, progress toward meeting climate and clean energy goals will be more difficult" and "ambitious energy efficiency policies can [only] get us about halfway to achieving national GHG goals by 2050."[7] They went on to conclude that:

> States should consider energy efficiency's potential to (1) reduce the costs of meeting clean electricity standards by managing demand on the grid; (2) aid electrification efforts to support emission reduction goals, and (3) strengthen and advance equitable decarbonization strategies to ensure that all customers are able to participate in and benefit from the clean energy transition.[8]

Energy Efficiency provides many benefits to meeting the carbon-free standard, such as reducing the costs associated with increasing clean energy generation since it lowers electricity consumption, which in turn aids in encouraging electrification of buildings and transportation, which has an impact on load growth and the amount of new capital investments needed to meet demand.[9] Energy Efficiency can also "help manage peak electricity demand….by both decreasing load during times of grid stress and alternately shifting load to time of over-generation to avoid curtailment of renewables."[10] It can also

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6 *Meeting State Climate Goals: Energy Efficiency Will be Critical*, Weston Berg, Emma Cooper and Maggie Molina, ACEEE Report (September 2021) at 34 ("ACEEE September 2021 Report"), attached as Exhibit 2. The ACEEE report can also be found at: https://www.aceee.org/research-report/u2104.

7 Exhibit 2 at iv-v.

8 Exhibit 2 at iv.

9 Exhibit 2 at v-vii.

10 Exhibit 2 at vii-viii.

help minimize the amount of land that is needed for clean energy development[11] – the less energy you use, the less infrastructure you need to meet the needs of customers.[12]

Not only does Energy Efficiency need to be addressed and incorporated into the overall effort to meet the 2045 carbon-free standard, but the General Assembly must "incorporate equitable practices to ensure that the benefits of meeting climate goals extend to all customers and do not result in shifting costs or pollution from persisting fossil fuel units to marginalized communities."[13] Low-income customers and predominantly minority communities are hit first and worst by the impacts of fossil-fuels; they live in areas that have disproportionately high levels of air pollution and they often live in housing with poor insulation and inefficient appliances and heating/cooling systems. The General Assembly must address the impacts to these customers and the barriers they face in participating in many energy efficiency programs, which can often have high upfront costs.[14]

Sierra Club's Modeling Shows Emissions Dropping to 5 Million Tons by 2035

Sierra Club was an intervening party in Dominion Energy Virginia's 2020 Integrated Resource Plan Docket and our expert, Rachel Wilson at Synapse Energy Economics, performed modeling using the EnCompass capacity optimization and dispatch model to simulate resource choice impacts, using Dominion's assumptions for peak and annual energy, load shape, reserve margin, unit retirements, offshore wind additions, distributed solar additions, commodity prices (fuel, CO_2, and hourly energy market prices), resource capacity values, resource capital costs, and sustaining capital costs at specific Dominion thermal units.[15] The EnCompass model was allowed to optimize resource additions and retirements, subject to the requirements of the VCEA. While Sierra Club believes some of Dominion's input values to be inflated, nevertheless, as compared to Virginia Energy's Modeling Results/PowerPoint, Synapse's results differ significantly. Strikingly, Synapse's modeling shows CO_2 emissions at approximately 6 million tons in

11 Exhibit 2 at 6.
12 *See* Exhibit 2 at 7, Table 1.
13 Exhibit 2 at ix.
14 *See* Exhibit 2 at 6, 64-66.
15 *See generally* Exhibit 1.

2035, as compared to Virginia Energy's 15 million tons.[16] While Sierra Club would like to be able to differentiate these drastic results, unfortunately, we do not have access to Virginia Energy's inputs and results. One potential reason for such a drastic difference in CO_2 emission could be the retirement of coal plants. Synapse's Optimization Portfolio, which allows EnCompass to endogenously retire plants that are uneconomic, shows the following, as compared to Dominion's preferred retirement dates:

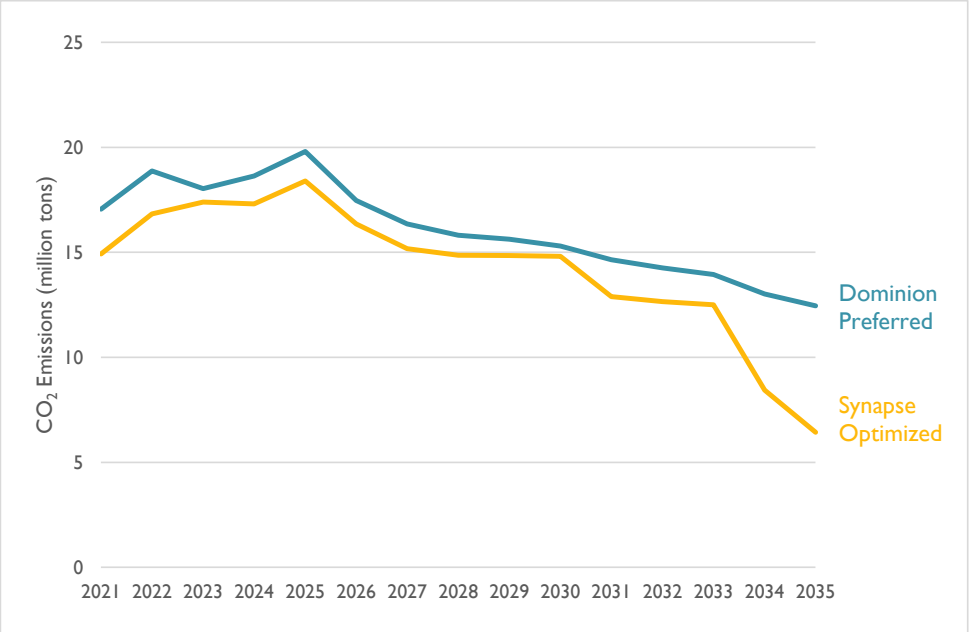
Table 2: Coal Retirement Results[17]

Unit	Dominion Retirement Date	Synapse Retirement Date
Chesterfield 5-6	2023	2021
Clover 1-2	2025	2025
Virginia City	2044	2031
Mt. Storm Unit 1	2043	2034
Mt. Storm Unit 2	2043	2034
Mt. Storm Unit 3	2043	2035

As Ms. Wilson stated in her Direct Testimony, "accelerated retirement of Mt. Storm Units 1-3 and the VCHEC [Virginia City Hybrid Energy Center] are also in the best interest of ratepayers. When given the choice to retire these units or keep them online for the duration of the analysis period, the EnCompass model chose to retire all four prior to 2035."[18] This results in a considerable drop in CO_2 emissions by 2035.

16 Exhibit 1, Figure 4 at 26.
17 Exhibit 1 at 16.
18 Exhibit 1 at 27-28.

Figure 1: Comparison of CO_2 emissions[19]



Sierra Club Recommendations

The Sierra Club respectfully submits the following recommendations for issues that need to be resolved in the modeling *before* the final report is sent to the General Assembly. We recognize and appreciate that making these changes and providing transparency to stakeholders and the public would require a delay in the submission of the report to the General Assembly, but we believe they are vital to getting to a least cost pathway:

- Include the full costs of continued carbon emissions, including the social cost of carbon, in the analysis of the least-cost pathways. In addition, the modeling should also show the positive impacts of increased electrical vehicle use and building electrification, which will reduce overall public costs, including health impacts, as reflected in the social cost of carbon
- Implement multiple modeling runs showing different paths to reaching carbon-free by 2045 in a least cost manner.
- Include energy efficiency in the least-cost modeling – at a minimum the VCEA requirements plus a similar annual percentage increase going beyond 2025.

19 Exhibit 1, Figure 4 at 26.

- Implement an energy efficiency sensitivity modeling run that uses a more aggressive energy efficiency standard.
- Retire coal as rapidly as possible in order to not only save ratepayers upwards of $500 million but it will also significantly decrease carbon emissions by 2035.
- Implement a modeling sensitivity on the impacts of building electrification and electric vehicle growth on load forecasts.

The Sierra Club respectfully submits the following recommendations for what must be included in the final report to the General Assembly:

- Adopt an aggressive energy efficiency standard for 2026 and beyond.
- Adopt legislation that will reduce the household energy burden for low-income customers by offering incentive programs.
- Address how the Commonwealth will actually reach carbon-free by 2045 (since the model only goes to 2040) and then address how to close the gap with the remaining 10 million tons of carbon between 2040 and 2045.
- Include a discussion on multiple pathways to get to carbon-free and the impacts on ratepayers of each pathway.

Respectfully Submitted,

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EXHIBIT 1

Direct
Testimony of
Rachel Wilson

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC AND POWER COMPANY

Case No. PUR-2020-00035

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

DIRECT TESTIMONY OF RACHEL WILSON

ON BEHALF OF THE SIERRA CLUB

PUBLIC VERSION

September 15, 2020

Summary of the Direct Testimony of Rachel Wilson

Dominion's 2020 Integrated Resource Plan is the first plan put forth by the Company that attempts to model compliance with the Virginia Clean Economy Act (VCEA), which mandates zero emissions from the electric sector by 2045. Dominions resulting resource plans add sizable volumes of renewable energy resources and retires certain fossil-emitting resources over the course of the planning period. Dominion's preferred plan, however, fixes unit additions—including 970 MW of new gas combustion turbines—and retirements in place in its modeling software rather than fully utilizing its optimization capabilities. As a result, four of Dominion's coal units and most of its gas units operate until at least 2043, and many do not retire until 2045, when the VCEA mandates the retirement of carbon-emitting resources.

My independent modeling examines two scenarios: 1) the Dominion Preferred scenario, which fixes the resources from Dominion's preferred Plan B; and 2) the Synapse Optimization scenario, which optimizes resource additions and the retirement dates for the Virginia City Hybrid Energy Center (VCHEC) and the Mt. Storm coal units. I find that Dominion is unnecessarily keeping its remaining coal units online through the analysis period. Retirement of these units prior to 2035, along with accelerated deployment of solar resources in the next five years, could result in both lower CO_2 emissions and ratepayer savings of up to $3.3 billion over the 15-year analysis period.

I recommend that the Commission require Dominion to revise its 2020 IRP to allow the PLEXOS model to endogenously retire the VCHEC and Mt. Storm Units 1-3 and to remove the 970 MW of new gas combustion turbines, allowing the model to make an optimal decision from amongst different clean energy resources that could meet Dominion's purported reliability need.

With respect to Dominion's assertion of future probable system reliability issues, I recommend the following: (1) that when Dominion's reliability study become available, the Company holds a technical conference to solicit feedback from stakeholders on its methodology and conclusions; and (2) any future CPCN proceeding for the new combustion turbines described in the IRP should be informed by an all-source RFP that allows for bids from battery storage resources.

Table of Contents

1. INTRODUCTION AND QUALIFICATIONS

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

A. My name is Rachel Wilson and I am a Principal Associate with Synapse Energy Economics, Incorporated ("Synapse"). My business address is 485 Massachusetts Avenue, Suite 3, Cambridge, Massachusetts 02139.

Q. Please describe Synapse Energy Economics.

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

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

Q. Please summarize your work experience and educational background.

A. At Synapse, I conduct analysis and write testimony and publications that focus on a variety of issues relating to electric utilities, including: integrated resource planning; federal and state clean air policies; emissions from electricity generation; environmental compliance technologies, strategies, and costs;

electrical system dispatch; and valuation of environmental externalities from power plants.

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

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

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

A copy of my current resume is attached as Exhibit RW-1.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Sierra Club.

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

A. Yes, in Case No. PUE-2015-00075, Case No. PUR-2018-00065, and Case No PUR-2020-00015.

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

A. The purpose of my testimony is to evaluate various components of Dominion's 2020 Integrated Resource Plan (2020 Plan) and present the results of an alternative modeling analysis. The Synapse modeling analysis produced a resource plan that retires additional fossil units during the analysis period to 2035, complies with the Virginia Clean Economy Act, and has lower carbon dioxide (CO_2) emissions than in the Dominion 2020 IRP. The Synapse resource plan also had a lower cost than Dominion's preferred resource plan, resulting in savings to the Company's ratepayers.

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

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

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit Number	Description of Exhibit	Protected Status
Exhibit RW-1	Resume of Rachel S. Wilson	Non-Confidential
Exhibit RW-2	Dominion's response to Appalachian Voices 1-29	Non-Confidential
Exhibit RW-3	Dominion's response to Appalachian Voices 1-30	Non-Confidential
Exhibit RW-4	Dominion's response to Staff 1-5	Non-Confidential
Exhibit RW-5	Dominion's responses to Sierra Club 2-6 and 2-8	Non-Confidential
Exhibit RW-6	Dominion response to Staff 1-17(a), Supplemental Attachment Staff 1-17(a) page 3	Non-Confidential
Exhibit RW-7	Dominion response to Staff 1-17(a), Supplemental Attachment Staff 1-17(a)	Extraordinarily Sensitive
Exhibit RW-8	Dominion response to Staff Set 01-02, Corrected Attachment Staff Set 01-02 (BMH) CONF	Confidential
Exhibit RW-9	Dominion response to Appalachian Voices 1-11	Non-Confidential
Exhibit RW-10	Dominion response to Appalachian Voices 3-4	Non-Confidential
Exhibit RW-11	Dominion response to Appalachian Voices 2-9	Non-Confidential

2. OVERVIEW OF TESTIMONY AND CONCLUSIONS

Q. Please summarize your primary conclusions.

A. Dominion's 2020 Plan is the first plan put forth by the Company that attempts to model compliance with the Virginia Clean Economy Act, adding sizable volumes of renewable energy resources and retiring certain fossil-emitting resources over the course of the planning period. Dominion's preferred plan, however, continues to operate certain of the Company's coal units, and the majority of its gas units,

until the last years of the extended analysis period to 2045, which is also the point at which the VCEA mandates the retirement of carbon-emitting resources.

My independent modeling indicates that Dominion is unnecessarily keeping the VCHEC and Mt. Storm units online, and that retiring them earlier would result in benefits to the Company's ratepayers. Retirement of these units prior to 2035, along with accelerated deployment of solar resources in the next five years, could result in both lower CO_2 emissions and ratepayer savings of up to $3.3 billion over the 15-year analysis period. A summary of the resource additions, retirements, and net present of revenue retirements between Dominion's preferred plan, as modeled by Synapse, and the Synapse Optimization scenario is shown in Table 1.

Table 1. Summary of results, Dominion Preferred versus Synapse Optimization (2035)

	Dominion Preferred	Synapse Optimization
NPV (2021-2035)	$54.9	$51.6
CO_2 Emissions (million tons)	12.4	6.4
Solar (MW)	15,920	12,800
Offshore Wind (MW)	5,112	5,112
Storage (MW)	2,714	2,700
Gas (MW)	970	0
Import/Export Capability (MW)	5,200	5,200
Retirements (MW)	3,183	5,422

Q. Please summarize your primary recommendations.

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

1. Dominion should be required to develop a robust estimate of the sustaining capital costs necessary to maintain the Virginia City Hybrid Energy Center (VCHEC) and Mt. Storm Units 1-3 through Dominion's planned retirement date, and then submit a revised IRP that allows the PLEXOS model to endogenously retire them. These sustaining capital costs should be included in the PLEXOS model for the purposes of determining an economic retirement date for these remaining coal-fired units.

2. In its revised IRP, Dominion should also be required to remove the 970 MW of new gas combustion turbines, allowing the model to make an optimal decision from amongst different clean energy resources that could meet Dominion's purported reliability need.

3. The Commission should require Dominion to hold a technical conference and stakeholder meeting when its gas reliability study becomes available in order to solicit feedback from stakeholders on its methodology and conclusions; and

4. Any future CPCN proceeding for the new combustion turbines described in the IRP should be informed by an all-source RFP that allows for bids from battery storage resources.

3. DOMINION'S PREFERRED RESOURCE PORTFOLIO

Q. Does Dominion's 2020 Plan differ substantially from previous IRPs filed by the Company?

A. Yes. Dominion's 2020 Plan is the first document created by the Company and filed with the Commission that considers the requirements of the Virginia Clean Economy Act (VCEA), which became law on July 1, 2020. The VCEA mandates 100 percent carbon-free energy from Dominion's generating fleet by 2045 and the development of solar, wind, storage, and energy efficiency resources. It also mandates the retirement of carbon-emitting resources unless specific retirements would threaten grid reliability or security.

Q. Which of Dominion's alternative resources plans do you focus on in your analysis?

A. Dominion presents four alternative resource plans labeled A through D. My testimony focuses on Dominion's Plan B for comparison with the Synapse modeling analysis because it is the Company's recommended plan.[1] Dominion notes, however, that Plans B through D look very similar over the first 15 years, with the primary difference being the amount of existing gas generation that retires by 2045.[2]

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1 Dominion 2020 Integrated Resource Plan. Executive Summary at 8.

2 *Id.* at 7.

Q. Which of its carbon-emitting resources does Dominion retire in its 2020 Plan?

A. Dominion retires over 3,000 MW of oil- and coal-fired capacity by 2035, as shown in Table 2, below.

Table 2. Unit retirements from Dominion's Preferred Plan B

Year	Unit	Capacity (MW)
2021	Possum Point 5	623
2022		
	Yorktown 3	790
2023	Chesterfield 5 and 6	1,014
2024		
2025	Clover 1 and 2	439
2026		
2027	Rosemary	165
	Altavista	51
	Hopewell	51
2028	Southampton	51
2029		
2030		
2031		
2032		
2033		
2034		
2035		
Total		**3,184**

Q. What does the 2020 Plan indicate are Dominion's plans for its remaining carbon-emitting resources in its preferred plan?

A. With respect to its coal-fired resources, it appears as though Dominion retires the Mt. Storm Units 1-3 at the end of 2043[3] and the VCHEC at the end of 2044.[4]

With respect to its gas-fired resources, Dominion states that it preserves 9,700 MW of gas-fired generation in Plan B to "address future system reliability, stability, and energy independence issues."[5]

Q. What kind of resources are added in Preferred Plan B?

In terms of unit additions, Dominion directed the PLEXOS model to add specific amounts of offshore wind, solar, and storage resources consistent with the requirements of the VCEA.[6] Annual additions for each of these resources were determined separately by the Company and input into PLEXOS.[7]

Plan B also adds 485 MW of gas-fired combustion turbines in both 2023 and 2024. Again, this 970 MW of new gas capacity was hardcoded into the PLEXOS model by Dominion as "a placeholder to address probable system reliability

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3 See Dominion's response to Appalachian Voices 1-29, attached as Exhibit RW-2.
4 See Dominion's response to Appalachian Voices 1-30, attached as Exhibit RW-3.
5 2020 Plan at 29.
6 See Dominion's response to Staff 1-5, attached as Exhibit RW-4.
7 See Dominion's responses to Sierra Club 2-6 and 2-8, attached as Exhibit RW-5.

issues resulting from the addition of significant renewable energy resources and the retirement of coal-fired facilities."[8] Annual resource additions through 2035 are shown in Table 3.

Table 3. Capacity additions in Dominion Plan B (nameplate MW)

Year	Utility PV	Solar DER	OSW	Battery Storage	Pumped Storage	Gas CT
2021						
2022	780	220				
2023	960			14		485
2024	960	220				485
2025	960					
2026	960	220	852	400		
2027	960		1,704	500		
2028	1,080	220				
2029	1,440			500		
2030	1,320	220			300	
2031	1,080					
2032	1,080			500		
2033	1,080					
2034	1,080		2,556	500		
2035	1,080					
Total	**14,820**	**1,100**	**5,112**	**2,414**	**300**	**970**

Q. How did Dominion arrive at its preferred resource portfolio with unit retirements and resource additions?

A. Dominion states that it directed PLEXOS, a model designed for capacity optimization and dispatch, to select specific resources over the analysis period,

8 See Exhibit RW-4.

which include storage, solar, offshore wind, and new combustion turbines.[9] This number of resource additions in a year was determined separately and then input into PLEXOS.[10] Unit retirements were also input into PLEXOS per the requirements of the VCEA. It appears as though the only optimal resource that PLEXOS was allowed to select was the volume of imports and exports in a given year.

Q. What is the implication of Dominion's methodology in which it hardcodes unit additions into the PLEXOS model in specific years?

A. PLEXOS is a capacity expansion and dispatch model designed to select the optimal (least-cost) resource mix to meet load, plus a required reserve margin, over a specified time period. The implication of hardcoding the various supply-side resources into PLEXOS is that the resulting resource portfolio is unlikely to be the least-cost portfolio from the ratepayer perspective.

4. SYNAPSE MODELED RESOURCE PORTFOLIO

Q. **Do you present an alternative to Dominion's modeling analysis?**

A. Yes, and I describe that alternative modeling analysis in this section.

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9 See Exhibit RW-4.

10 See Exhibit RW-5.

Q. Which model did you use to perform your analysis?

A. The Synapse analysis uses the EnCompass capacity optimization and dispatch model to simulate resource choice impacts in Dominion's service territory. Developed by Anchor Power Solutions, EnCompass covers all facets of power system planning, including:

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

Q. Is EnCompass a widely accepted industry model?

A. Yes. EnCompass was released in 2016 and already several major utilities have made the transition to the model. For example, the three investor-owned utilities (IOUs) in Minnesota (Minnesota Power, Otter Tail Power, and Xcel Energy) adopted the EnCompass model in 2019, along with Great River Energy, the

largest of the state's electric cooperatives.[11] Duke Energy announced in 2020 that it had implemented EnCompass to expand its capabilities in resource planning.[12] Public Service New Mexico and Public Service Company of Colorado are two other IOUs that have adopted EnCompass in recent years.

Q. What did Synapse model in its analysis?

A. Synapse modeled two scenarios:

- **Dominion Preferred**, which fixes all of Dominion's Plan B resource additions and retirements in the year in which they are modeled by the Company. This scenario was run in order to compare the resulting revenue requirement of the Company's preferred resource portfolio to that produced by the Synapse Optimization portfolio.[13]

11 Anchor Power Solutions. December 2019. Available at: https://anchor-power.com/news/minnesota-plans-for-its-energy-future-with-encompass/

12 Anchor Power Solutions. May 2020. Available at: https://anchor-power.com/news/duke-energy-implemented-encompass-software/

13 Because the PLEXOS model uses different optimization and dispatch algorithm than the EnCompass model, using the Dominion revenue requirement for Plan B does not provide an apples-to-apples comparison. In addition, the Synapse modeling and resulting revenue requirement includes resource additions and system dispatch only and does not include the additional elements shown in Figure 2.4.1 of the 2020 IRP.

- **Synapse Optimization**, which fixes the addition of offshore wind, pursuant to the requirements of the VCEA, and distributed solar according to Dominion's forecast. It sets the retirements of the oil, biomass, and coal units shown in Table 2, but allows Chesterfield and Clover to retire before their 2023 and 2025 retirement dates if EnCompass finds earlier retirement to be economic. The EnCompass model optimizes the remaining resource additions and retirements, subject to the requirements of the VCEA.

Q. Do the input assumptions used in the Synapse analysis conform to Dominion's assumptions?

A. Yes. To ensure a valid comparison, the Synapse analysis uses Dominion's assumptions for peak and annual energy, load shape, reserve margin, unit retirements (those shown in Table 2 as well as the CT retirements found in Appendix 5J of the 2020 Plan), offshore wind unit additions, distributed solar additions, commodity prices (fuel, CO_2, and hourly energy market prices), resource capacity values, resource capital costs, and sustaining capital costs at specific Dominion thermal units.[14] [15]

14 This data is contained in numerous discovery request responses and represents thousands of pages: Dominion's response to Appalachian Voices 1-20, 2-11, 3-2(b); Sierra Club Set 2-15, 2-16, 3-2 and Staff 1-2. Sierra Club can provide the Commission or participants with copies of this information for the record prior to the hearing if it would be helpful.

15 In both Synapse modeled scenarios—the Dominion Preferred and Synapse Optimization—Synapse inadvertently used the solar profile for the PJM-DOM zone

Q. Are there any of Dominion's input values that you believe to be inflated?

A. Yes. At a minimum, I believe that Dominion's near-term load is inflated as it does not consider the effects of the current Covid-19 pandemic. Dominion has also overstated the capital costs for solar and battery storage technologies. Each of these criticisms is described below in my testimony; however, I used Dominion's numbers in my analysis in order to make a valid comparison between the two models.

Q. How does the resulting Synapse Optimization scenario compare to the Dominion Preferred scenario in terms of unit retirements?

A. The Synapse Optimization scenario chooses to endogenously retire early all of Dominion's coal units, except for Clover 1 and 2, which remains in 2025. Chesterfield 5 and 6 retire in 2021 rather than the scheduled date of 2023. VCHEC retires in 2031, more than 10 years earlier than in Dominion's 2020 Plan. Mt. Storm Units 1 and 2 retire in 2034, while Unit 3 retires in 2035. A comparison of the Dominion retirement dates versus those determined in the Synapse modeling is shown in Table 4.

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contained in our existing EnCompass database, which results in a capacity factor for utility scale solar of 22 percent.

Table 4. Comparison of coal unit retirement dates

Unit	Dominion Retirement Date	Synapse Retirement Date
Chesterfield 5-6	2023	2021
Clover 1-2	2025	2025
Virginia City	2044	2031
Mt. Storm Unit 1	2043	2034
Mt. Storm Unit 2	2043	2034
Mt. Storm Unit 3	2043	2035

Q. Are there other data that indicate that the early retirements of the VCHEC and Mt. Storm plants is reasonable?

A. Yes. Dominion did a unit retirement analysis for Chesterfield, Clover, VCHEC, Mt. Storm, and Yorktown 3 and presented the results of that study from March 2020.[16] The Company forecasted the costs and revenues for each unit's operation between 2020 and 2029, calculating the net present value of revenues over the combined period under a Base case and six sensitivity cases. Dominion's results show that Mt. Storm was the only plant to have a positive NPV in the Base case over the Company's analysis period. Those results are shown in Table 5.

16 Dominion response to Staff Set 01-17(a), Supplemental Attachment Staff Set 01-17(a), page 3, attached as Exhibit RW-6.

Table 5. Dominion 10-year NPV results, 2020-2029

Unit	NPV ($Million)
Chesterfield 5-6	($78)
Clover	($21)
Mount Storm	$100
Virginia City	($472)
Yorktown 3	($18)

Q. Table 5 shows that VCHEC is the worst performing unit by a wide margin. Why does the Synapse analysis not retire that plant until 2031 if the economics are so bad?

A. There are two primary reasons that the Synapse analysis may not retire VCHEC until 2031. First, the Chesterfield and Clover plants must retire by certain dates in order to comply with the VCEA, and in fact the Synapse analysis accelerates the retirement of Chesterfield Units 5 and 6. The retirement of these units changes the economics of the remaining units in the fleet, potentially making them more profitable. Second, Dominion's analysis does not include a value for replacement capacity that may be needed if certain units retire. The Synapse modeling study builds new capacity when needed to meet system load, determining the date at which units can economically retire and be replaced. Dominion should, however, do a stacked retirement analysis that examines the unit retirements in combination with each other.

Q. In contrast, Table 5 shows that Dominion found a net benefit to keeping the Mt. Storm units online. Why does the Synapse analysis retire them?

A. The study period for Dominion's unit analysis only goes through 2029. The Synapse analysis retires the Mt. Storm units in 2034 and 2035, respectively, which falls outside of Dominion's analysis period. In the latter part of that analysis period, the Mt. Storm plant operates at capacity factors ranging from **[BEGIN EXTRAORDINARILY SENSITIVE INFORMATION]** [redacted] **[END EXTRAORDINARILY SENSITIVE INFORMATION]** These increased costs are not included in either the Dominion or the Synapse analysis, and so it is very possible that the optimal retirement dates for the Mt. Storm units are even *earlier* than in the Synapse modeling.

Q. What are the risks of keeping the VCHEC and Mt. Storm units online until Dominion's retirement dates of 2044 and 2043, respectively?

A. There are risks to reliability of continued coal operation. When units operate at lower capacity factors and increase the amount of cycling required, the increased

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17 Dominion response to Staff Set 01-17(a), Attachment Staff Set 01-17(a) ES, attached as Exhibit RW-7.

degradation can lead to higher forced outage rates.[18] A forced outage at even one coal unit represents the loss of hundreds of MW of capacity, increasing reliability risk on the system. Solar and battery storage resources are more modular and can be distributed across Dominion's service territory, offering greater flexibility and reducing reliability risk.

Q. How does the resulting Synapse Optimization scenario compare to the Dominion Preferred scenario in terms of resource additions?

A. Generally, in comparison to the Dominion Preferred scenario, the Synapse Optimization scenario adds fewer total resources over the analysis period to 2035, while also retiring additional coal capacity. Total capacity as of 2035 is shown in **Table 6** for both the Dominion Preferred and Synapse Optimization scenarios.

18 National Renewable Energy Laboratory. 2012. *Power Plant Cycling Costs*. Available at: https://www nrel.gov/docs/fy12osti/55433.pdf.

Table 6. Comparison of total capacity in the Synapse modeled scenarios, 2035

Resource Type	Dominion Preferred (MW)	Synapse Optimization (MW)
Nuclear	3,701	3,701
Coal	2,239	0
Gas	9,552	8,582
Hydro	289	289
Biomass	157	157
Landfill	0	0
Utility Solar	16,446	13,326
DG Solar	1,100	1,100
Pumped Hydro	2,108	2,108
Offshore Wind	5,124	5,124
Onshore Wind	77	77
Battery Storage	2,414	2,400
Total	**43,207**	**36,864**

Notably, EnCompass does not select any new gas capacity in the Synapse Optimization scenario and does not show any resulting loss of load hours in the absence of these gas units. The model selects fewer utility-scale solar resources over the entirety of the planning period but selects solar resources well above those modeled by Dominion in the first seven years of the analysis period.

Q. Are there any annual incremental differences in the resources selected by EnCompass in the Synapse Optimization scenario?

A. Yes. Cumulative capacity, by year, is shown in Table 7 for those resources for which there is a notable difference between scenarios.

Table 7. Annual cumulative capacity (MW), by resource type

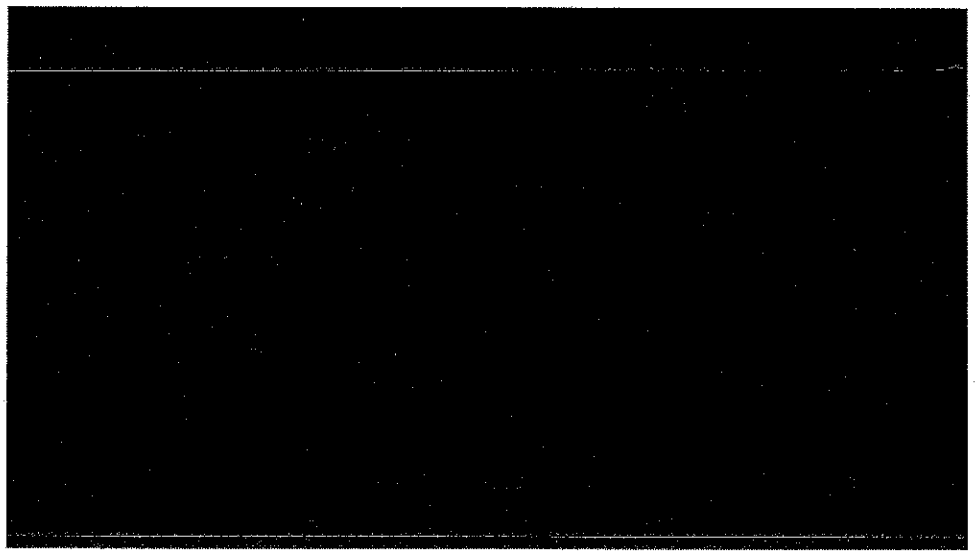
Year	Gas	Utility Solar	Battery Storage	Gas	Utility Solar	Battery Storage
2021	-	-	-	-	2,380	-
2022	-	780	-	-	3,180	-
2023	485	1,740	14	-	4,360	-
2024	970	2,700	14	-	5,500	-
2025	970	3,660	14	-	6,500	-
2026	970	4,620	414	-	6,500	-
2027	970	5,580	914	-	6,500	-
2028	970	6,660	914	-	6,500	-
2029	970	8,100	1,414	-	6,500	-
2030	970	9,420	1,414	-	7,340	-
2031	970	10,500	1,414	-	10,020	-
2032	970	11,580	1,914	-	10,140	-
2033	970	12,660	1,914	-	11,700	432
2034	970	13,740	2,414	-	11,700	1,416
2035	970	14,820	2,414	-	11,700	2,700

First, the Synapse Optimization scenario adds utility-scale solar capacity at a much faster rate over the first seven years of the analysis period, indicating that solar is a more economic resource at the beginning of the analysis period than in Dominion's plan, even at the Company's assumed capital costs. Battery storage resources are not selected until close to the end of the analysis period, which may be due to overstated capital cost assumptions.

Q. Is it your opinion that Dominion's cost assnmptions for solar resources are too high?

A. Yes. When compared to the *2020 Advanced Technology Baseline* (ATB) released by the National Renewable Energy Laboratory (NREL),[19] Dominion's assumed cost for solar is shown to be higher than industry projections, as shown in Confidential Figure 1. In contrast to the NREL forecast, which declines through 2030, Dominion's increases steadily between 2022 and 2045.

Confidential Figure 1. Dominion overnight solar costs versus NREL's ATB[20]



Dominion predicted solar cost increases in previous IRPs[21] and has been proven wrong, as prices have continued to decline. Technology innovations in solar

19 National Renewable Energy Laboratory. 2020. *Advanced Technology Baseline.* Available at: https://atb.nrel.gov/

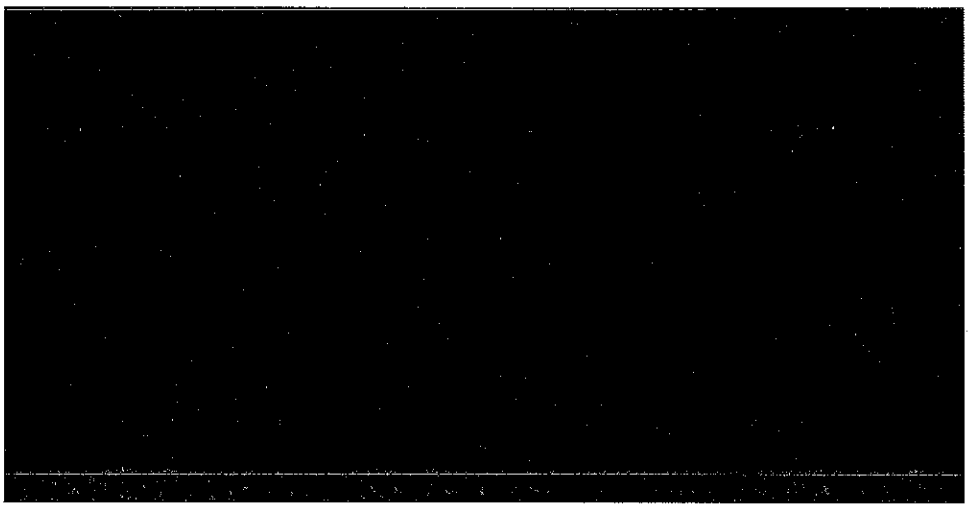
20 Dominion response to Staff Set 01-02, Corrected Attachment Staff Set 01-02 (BMH) CONF, attached as Exhibit RW-8.

wafers, cells, and modules are expected to increase solar panel power output without the same proportional increase in manufacturing costs, resulting in a lower cost for solar technologies in dollars per watt through the 2020s.[22]

Q. Is it your opinion that Dominion's cost assumptions for battery storage resources are too high?

A. Yes. Again, when we compare Dominion's forecast to that from NREL's ATB, as shown in Confidential Figure 2, we see that NREL's forecast for battery costs is substantially lower than that used by Dominion in the 2020 IRP.

Confidential Figure 2. Dominion battery storage costs versus NREL ATB[23]



21 Direct Testimony of Rachel Wilson before the Virginia Corporation Commission. Docket No. PUR-2018-00065. 2019. Page 20, line 1.

22 Sun, Xiaojing. December 17, 2019. *Solar Technology Got Cheaper and Better in the 2010s. Now What?* GreenTech Media. Available at: https://www.greentechmedia.com/articles/read/solar-pv-has-become-cheaper-and-better-in-the-2010s-now-what

23 See Exhibit RW-8.

Q. Is it realistic to think that Dominion could add 2,380 MW of solar generation in 2021?

A. It would be extremely challenging for Dominion to add 2,380 MW of solar in 2021. Solar resources were made available to the EnCompass model for selection beginning in 2021, and the model made its selection in order to develop the least-cost resource portfolio, replacing the energy and a portion of the capacity from the early retirement of Chesterfield Units 5 and 6.

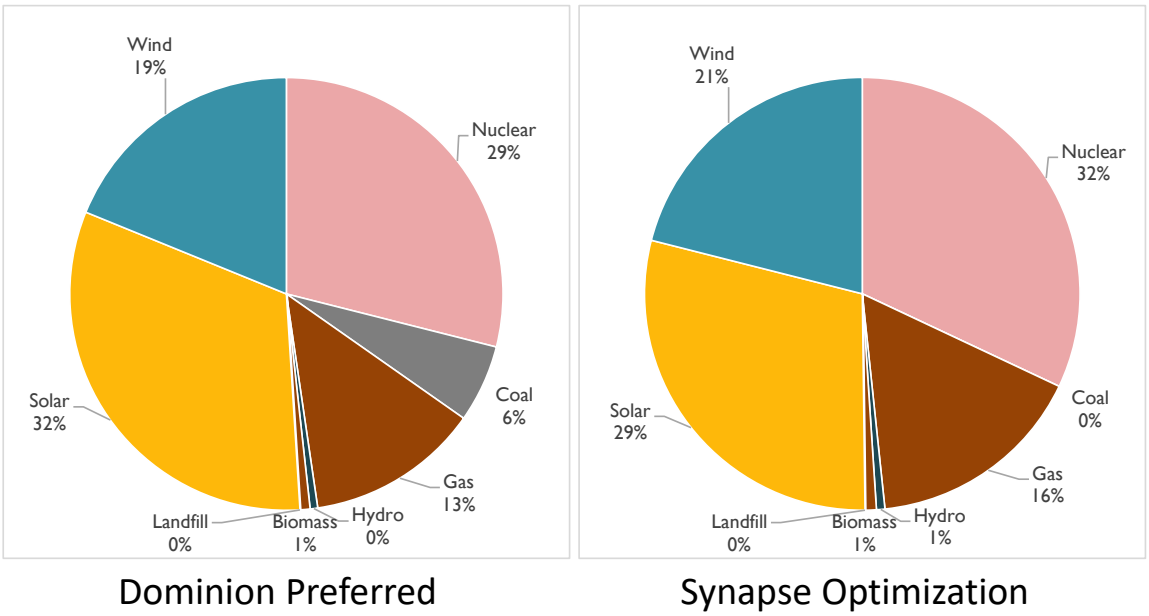
In contrast, Dominion adds zero MW of new solar in 2021 in its IRP. The Company can almost certainly add more than zero MW. Even at the costs assumed by Dominion, optimization modeling shows that solar has benefits to ratepayers as early as 2021, and Dominion should make every effort to help ratepayers realize those benefits.

Q. Describe the differences in the amount of generation from different resource types between the two modeled scenarios.

A. Generation between the Dominion Preferred and Synapse Optimization scenarios is quite similar. The amount of solar generation is lower in the Synapse Optimization scenario because there is less solar capacity in the mix. Because coal generation drops to zero by 2035 in the Synapse Optimization scenario, there is slightly more gas generation than in the Dominion Preferred scenario. The fuel mix in 2035 is shown for both scenarios in Figure 3. Battery storage and pumped

hydro are not shown in Figure 3 because they do not generate electricity, but discharge generation from other fuel sources.

Figure 3. Comparison of generation mix between modeled scenarios



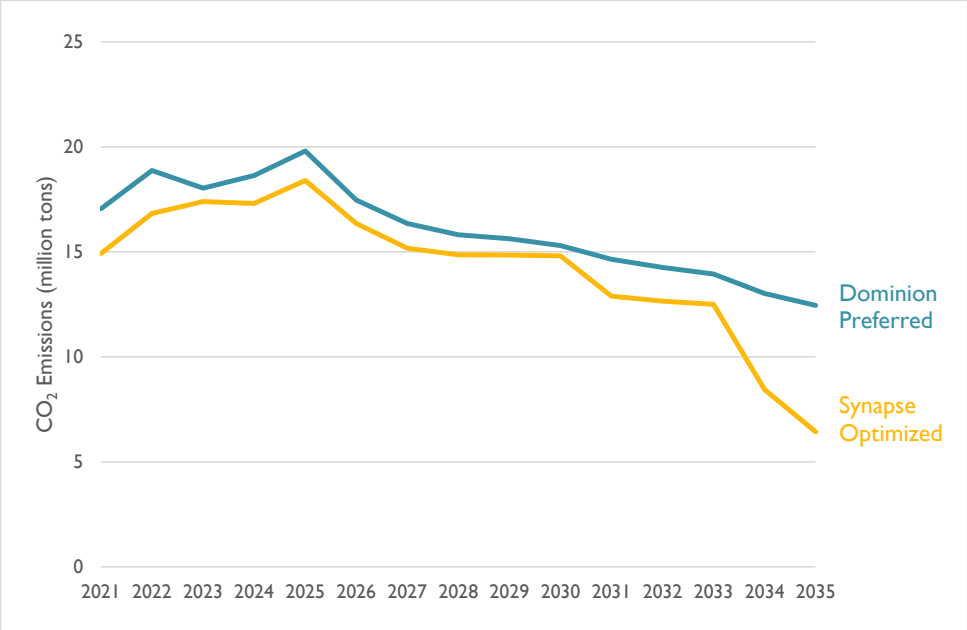
The biggest difference in fuel mix between the two scenarios is in the amount of net imports, which are larger in the Synapse Optimization scenario as a result of both fewer market sales and additional market purchases.

Q. How do CO_2 emissions compare between the Dominion Preferred and Synapse Optimization scenarios?

A. Emissions of CO_2 in the Synapse Optimization scenario are lower than in the Dominion Preferred, as shown in Figure 4. Emissions are immediately lower due to the early retirement of Chesterfield Units 5 and 6 and the addition of new solar

resources and drop further at the end of the analysis period because of the retirements of VCHEC and Mt. Storm Units 1-3.

Figure 4. Comparison of CO_2 emissions in the Synapse modeled scenarios



Q. Does the Synapse Optimization portfolio result in lower costs to Dominion ratepayers?

A. Yes. The Net Present Value of Revenue Requirements (NVPRR) totals just under $51.6 billion for Synapse Optimization portfolio compared to $54.9 billion for the Dominion Preferred portfolio for the analysis period through 2035, resulting in

cost savings to Dominion customers of approximately $3.3 billion.[24] The breakdown of costs by category is shown in Table 8.

Table 8. NPVRR of the Synapse modeled scenarios

Cost Category	Dominion Preferred ($B)	Synapse Optimization ($B)
Fuel Costs	$10.2	$9.6
Fixed Costs	$11.7	$11.6
Non-Fuel Variable Costs	$3.0	$2.9
Program Costs	$0.9	$0.8
Net Purchases	$4.2	$4.7
Commitment Costs	$0.7	$0.7
Capital Costs	$24.3	$21.4
Total	**$54.9**	**$51.6**

Q. What should the Commission conclude from the Synapse modeling analysis?

A. There are several important takeaways from the Synapse modeling analysis. First, the Commission should note that it is in the economic interest of Dominion's ratepayers to integrate additional solar capacity at a faster pace than what is included in Dominion's resource plans. Increased generation from solar in the short-term displaces more expensive fossil generation and results in savings to ratepayers. Second, accelerated retirement of Mt. Storm Units 1-3 and the VCHEC are also in the best interest of ratepayers. When given the choice to retire

24 The Synapse modeling and resulting revenue requirement includes resource additions and system dispatch only and does not include the additional elements shown in Figure 2.4.1 of the 2020 Plan.

these units or keep them online for the duration of the analysis period, the EnCompass model chose to retire all four prior to 2035. This is in stark contrast to Dominion's plans, which keeps Mt. Storm online until 2043 and the VCHEC online until 2044.

Q. What are the factors that the EnCompass model considers when deciding whether to retire a unit?

A. The Synapse modeling analysis uses the EnCompass model to optimize resource builds and retirements over the entire analysis period from 2021 to 2035, meaning the model can anticipate future conditions and respond accordingly. In the instance of coal retirements, EnCompass takes into consideration future capital expenditures at the units and variables that increase dispatch costs, like an allowance price for CO_2. The model also sees the capital cost trajectories for replacement resources and makes a retirement decision at the point in time that optimizes avoided unit costs and expenditures with cost of replacement capacity and energy.

Q. What are your recommendations to the Commission with regard to the resource mix in Dominion's Preferred Plan B?

A. Dominion's 2020 Plan does not include any scenarios in which alternative retirement dates are considered for the Mt. Storm and VCHEC plants. I recommend that the Commission require Dominion to submit a revised 2020 IRP that allows the PLEXOS model to endogenously retire the VCHEC and Mt. Storm

Units 1-3, after the development of a robust estimate of the sustaining capital costs necessary to maintain the plants through the current retirement dates of 2044 and 2043, respectively. These sustaining capital costs should be included in the PLEXOS model for the purposes of determining an economic retirement date for these remaining coal-fired units.

6. DOMINION HAS NOT DEMONSTRATED A RELIABILITY-RELATED NEED FOR NEW GAS COMBUSTION TURBINES

Q. Your Synapse Optimization scenario shows that the least-cost resource portfolio, which is also compliant with the VCEA, does not add new gas-fired combustion turbines. Why does Dominion include 970 MW of new gas in its Preferred Plan B?

A. Dominion states that it has added this 970 MW of new gas capacity "as a placeholder to address probable system reliability issues resulting from the addition of significant renewable energy resources and the retirement of coal-fired facilities."[25]

Q. Does Dominion specify the nature of those probable system reliability issues?

A. No. The Company only states that "Based on its knowledge of planning and operating its transmission system, the Company knows that the loss of stored kinetic energy resulting from the additional (sic) of significant inverter-based

25 2020 Plan at 30.

generation and the retirement of traditional turbine generation will cause technical issues for the grid that warrant further analysis."[26]

Q. Does Dominion say when it will better understand the nature of these probable system reliability issues?

A. Dominion has only stated that an analysis is underway to evaluate these probable system reliability issues.[27] The Company has not shared its expectation as to the date at which this study will be complete.[28]

Q. Did you evaluate Dominion's claims around probable system reliability issues in your analysis?

A. No. While EnCompass does perform its optimization and dispatch analysis while considering certain reliability metrics, it does not do the kind of detailed analysis that I assume Dominion has undertaken or plans to undertake. I will note, however, that the Synapse Optimization scenario did not show any loss of load hours for any of the years in the planning period.

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26 See Dominion response to Appalachian Voices 1-11, attached as Exhibit RW-9.

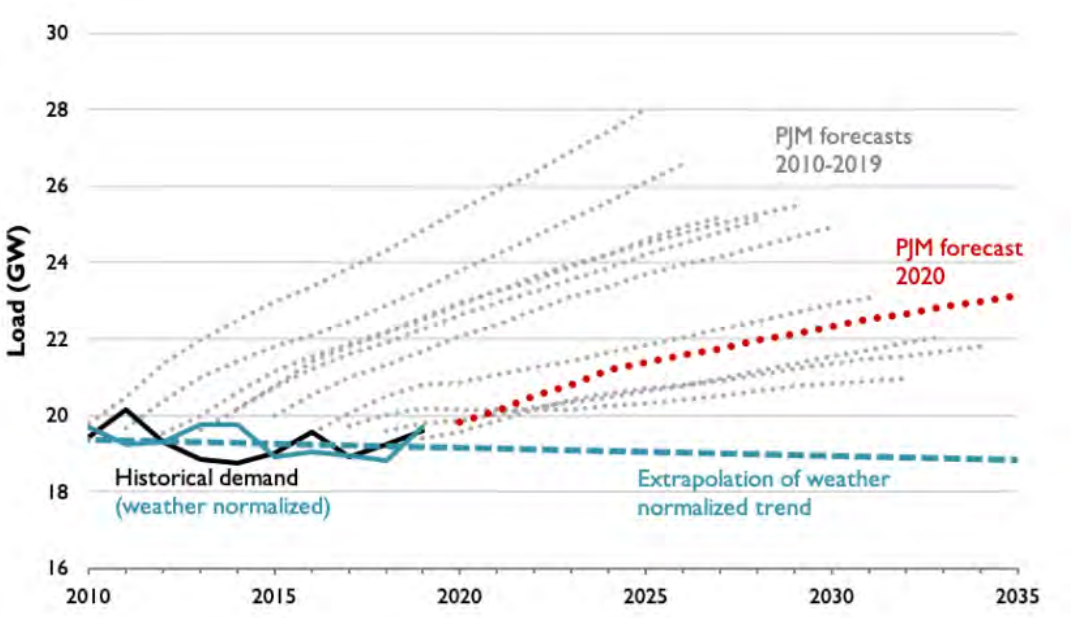
27 See Exhibit RW-9.

28 See Dominion response to Appalachian Voices 3-4, attached as exhibit RW-10.

Q. Without knowing the specifics around Dominion's "probable system reliability issues," are there any mitigation measures that might be undertaken rather than assuming the need for placeholder gas CTs?

A. Yes. The first is related to forecasted load growth. In its 2020 Plan, Dominion starts with the PJM load forecast for the DOM zone as the basis for its own load forecast. PJM's forecast grows at a compound annual rate of 1.0 percent. As shown in Figure 5, below, historical load growth has been closer to flat.

Figure 5. Actual versus forecasted peak demand in the PJM DOM zone (weather normalized)



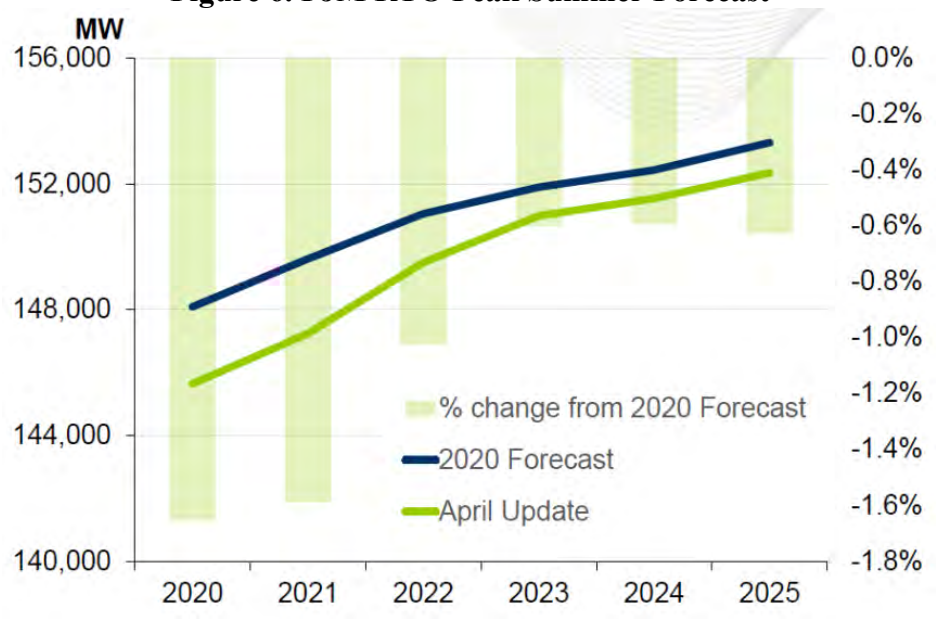
***Source: Synapse Energy Economics.* 2020. Alternatives to the Surry-Skiffes Creek 500 kV Transmission Line. Prepared for National Parks Conservation Association.**[29]

29 Available at: https://www.synapse-energy.com/sites/default/files/Synapse-Jamestown-Report-20-003.pdf

The PJM load forecast used by Dominion was created prior to Covid-19 and does not account for any effects on load due to the pandemic. Dominion did not make any adjustments to its load forecast, nor assessed the long-term effects of Covid-19 on the Company's load forecast.[30]

PJM released an "April Update" to its load forecast that uses the same modeling as the 2020 Forecast but utilizes the *April 2020 Economic Forecast* from Moody's Analytics as its basis. The load forecast for PJM in the April Update is lower than the 2020 Forecast by 1.6 percent in 2021 and 0.6 percent lower from 2023 to 2025, as shown in Figure 6.

Figure 6. PJM RTO Peak Summer Forecast



***Source: PJM Planning Committee. June 20, 2020. Update of COVID-19 Load Impacts*[31].**

30 See Dominion response to Appalachian Voices 2-9, attached as Exhibit RW-111.

31 *Available at: https://www.pjm.com/-/media/committees-groups/committees/pc/2020/20200602/20200602-item-07-covid-19-impacts-and-load-forecast.ashx*

It is possible that anticipated reductions to peak load would mitigate some of Dominion's anticipated reliability issues as they relate to capacity and/or resource adequacy.

Q. Are there supply-side resources other than gas-fired combustion turbines that could mitigate reliability issues?

A. Yes, certainly. One option would be to convert retiring steam plants to synchronous condensers to provide voltage support. A second option would be to add battery storage in 2023/2024 in place of the combustion turbines. The Yorktown, Chesterfield, and Clover locations would likely be suitable for siting battery installations and would provide reliability support that might be needed, particularly for transmission-related reliability issues. The comparison between Dominion's projected cost of storage and industry projections shown in Confidential Figure 2, on page 23, indicate that battery storage capacity could be a more economical solution than combustion turbines.

Q. Is there evidence from other jurisdictions that battery storage can fulfill reliability needs in a similar way to gas-fired combustion turbines?

A. Yes. Southern California Edison recently selected several battery storage projects totaling 195 MW to meet local capacity needs, after the California Independent

System Operator determined that storage could fulfill the reliability need. The project replaced the 262 MW gas peaking unit that had previously been chosen.[32]

Q. Do you have any recommendations regarding Dominion's assertion of future probable system reliability issues?

A. I have two recommendations with respect to Dominion's assertion of future probable system reliability issues: (1) when Dominion's reliability study become available, the Company holds a technical conference to solicit feedback from stakeholders on its methodology and conclusions; and (2) The Commission should require the Company satisfy the requirement in § 56-585.1 A 6 for considering and weighing alternative options (including energy storage options) by presenting, among other things, the results of an all-source RFP that allows for bids from battery storage resources in any future CPCN proceeding for the 970 MW of new combustion turbines described in the IRP.

7. CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your conclusions.

A. Dominion's 2020 Plan is the first plan put forth by the Company that attempts to model compliance with the Virginia Clean Economy Act, adding sizable volumes

32 Spector, J. 2019. "Southern California Edison Picks 195 MW Battery Portfolio in Place of Puente Gas Plant." *Greentech Media.* Available at: https://www.greentechmedia.com/articles/read/sce-picks-major-battery-portfolio-in-place-of-puente-gas-plant.

of renewable energy resources and retiring certain fossil-emitting resources over the course of the planning period. Dominion's preferred plan, however, continues to operate certain of the Company's coal units, and the majority of its gas units, until the last years of the extended analysis period to 2045, which is also the point at which the VCEA mandates the retirement of carbon-emitting resources.

My independent modeling indicates that Dominion is unnecessarily keeping the VCHEC and Mt. Storm units online, and that retiring them earlier would result in benefits to the Company's ratepayers. Retirement of these units prior to 2035, along with accelerated deployment of solar resources in the next five years, could result in both lower CO_2 emissions and ratepayer savings of up to $3.3 billion over the 15-year analysis period.

Q. Please summarize your recommendations.

A. I recommend that the Commission require that Dominion revise its 2020 Plan to allow the PLEXOS model to endogenously retire the VCHEC and Mt. Storm Units 1-3, after the development of a robust estimate of the sustaining capital costs necessary to maintain the plants through Dominion's current retirement dates of 2044 and 2043, respectively. Dominion should also be required to remove the 970 MW of new gas combustion turbines, allowing the model to make an optimal decision from amongst different resources that could meet Dominion's purported reliability need.

I have two recommendations with respect to Dominion's assertion of future probable system reliability issues: (1) that when Dominion's reliability study become available, the Company holds a technical conference to solicit feedback from stakeholders on its methodology and conclusions; and (2) any future CPCN proceeding for the new combustion turbines described in the IRP should be informed by an all-source RFP that allows for bids from battery storage resources.

Q. Does this conclude your direct testimony?

A. Yes.

Comments to Virginia Energy

On the Report to the General Assembly:

Getting to Carbon-Free Electric Generation At Least Cost to Ratepayers

Lena Lewis, Energy and Climate Policy Manager

The Nature Conservancy

October 12, 2021

Thank you for the opportunity to submit comments. We appreciate the thought and rigor that has gone into the modeling used to produce the draft least-cost pathway. Our comments will focus on recommendations to include more analysis of the impact of energy efficiency on the least-cost path to a zero-carbon power sector. We offer three recommendations: 1) analyze a "Lower Demand" policy scenario that assumes Virginia utilizes its full energy efficiency potential, 2) add energy efficiency as a resource to the portfolio of resources used to achieve the least-cost pathway, and 3) assume the Energy Efficiency Resource Standard (EERS) targets will increase after 2025 to the level of targets used by leading states.

Analyze a Lower Demand Policy Scenario with a Floor of 18.7% Energy Savings by 2035

Maximizing Virginia's use of energy efficiency is essential to achieving a zero-carbon power sector at least cost to ratepayers. The cheapest kilowatt hour is the one never generated. Making full use of Virginia's energy efficiency potential will have the added benefits of employing Virginians locally while reducing all environmental impacts of all types of energy generation and storage.

Consequently, we think it is important that you analyze the "Lower Demand" policy scenario that was listed as one of the "Scenarios Under Consideration" on slide 23 of the September 9th presentation "Getting to Carbon Free Electric Generation at Least Cost to Virginia Ratepayers." On that slide, the motivation listed for "Lower Demand" is "EE greater than VCEA." Certainly, one possibility leading to lower demand is that the energy efficiency goals could be higher than currently stated under the VCEA. In addition, many other pathways to improved efficiency are currently underutilized in Virginia. Some include more stringent building codes and appliance efficiency standards, standards for megawatt hours saved through the Housing Innovation in Energy Efficiency (HIEE) program, building performance standards, energy savings contracts, widespread availability of Commercial Property Assessed Clean Energy (C-PACE) and green banks, and improved demand side management through effective use of advanced metering infrastructure.

We recommend that the report include a "Lower Demand" scenario in which the full energy efficiency potential from the residential, commercial, and industrial sectors is achieved. This would illustrate how much difference could be made by a highly efficient consumption of electricity in Virginia's least-cost path to decarbonization. The "Lower Demand" scenario should use the best available assumptions from a leading jurisdiction to bound it. To give a sense of a lower bound for this scenario, the 2017 State Level Electric Energy Efficiency Potential Estimates report by the Electric Power Research Institute (EPRI)

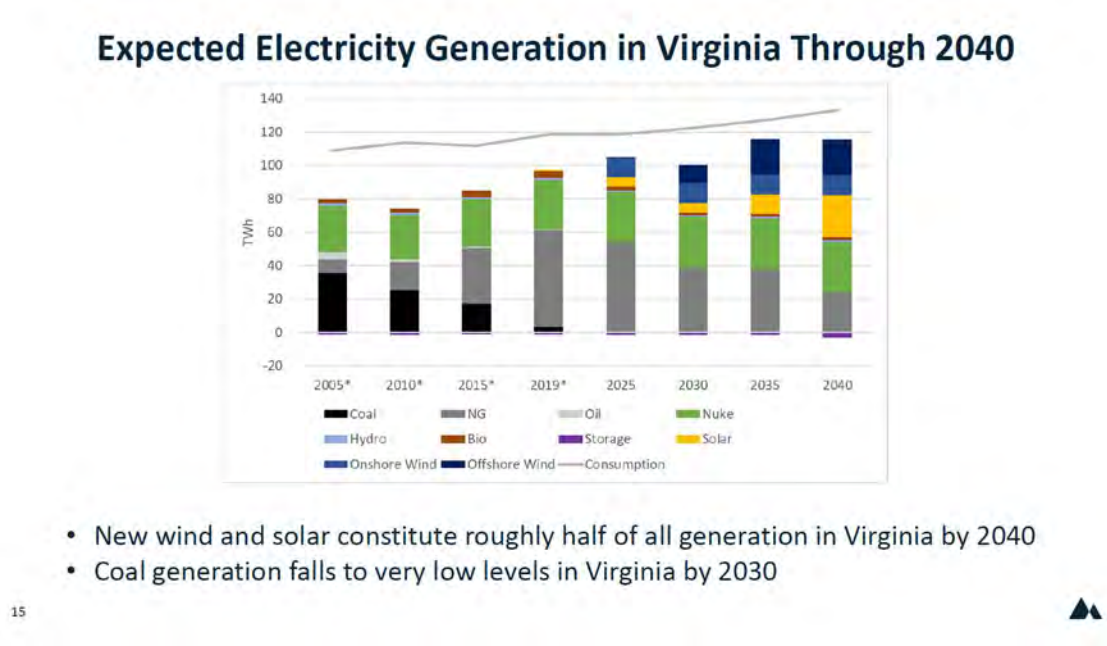
9estimates that Virginia's energy efficiency potential will grow to 18.7% (or 26,696 GWh) by 2035.[1] This should be a floor for the "Lower Demand" scenario, rather than the upper bound, because we believe EPRI's methodology overlooked some energy efficiency potential.

Add Energy Efficiency as A Resource to the Portfolio of Resources Used to Achieve the Least-Cost Pathway

We also recommend taking the analysis of energy efficiency a step further by making use of the EERS that will be required of investor-owned utilities beginning in 2022. The EERS essentially considers energy efficiency to be an energy resource, the same as solar, natural gas, nuclear, and coal. The megawatt hours saved by investor-owned utility energy efficiency programs will go through a process of evaluation, measurement, and verification annually. Therefore, including them in a quantitative model is appropriate, informative, and useful.

The graph shown on slide 15 of the September 9th presentation and referenced below shows the traditional sources of energy. The terawatt hours saved through energy efficiency should be added to this graph. We expect that it would appear below the x-axis, along with storage. If the bar representing energy efficiency is too slim to see compared to other energy sources, it should be noted in writing along with the graph. Adding the contribution of the EERS to this graph and comparing its contribution to those of other energy sources is an important opportunity to remind decisionmakers of the role of energy efficiency.

Slide 15



[1] *State Level Electric Energy Efficiency Potential Estimates:* EPRI, Palo Alto, CA: 2017. 3002009988. https://www.epri.com/research/products/000000003002009988

Assume the EERS Targets Will Increase After 2025 to the Level of Other Leading States

We disagree with the model's current assumption that the State Corporation Commission will maintain the 2025 EERS goals for subsequent years. We think it is highly likely that the SCC will recognize that utilities are capable of providing additional energy efficiency programs to their customers at lower cost than electricity generation. We recognize that it is not possible to predict a future SCC ruling with certainty. We suggest that a high-end sensitivity test could be used, similar to the high-end energy demand sensitivity scenario demonstrated in the September 9th presentation, as shown on slides 19-22. We propose that a high-end scenario could have the following EERS targets, in line with targets from EERS programs in states that are leading the way in energy efficiency:

> Dominion:
>
> Beginning in 2025, a linear increase to 2% incremental energy savings target in 2030 and maintaining a 2% incremental savings every year after.
>
> Appalachian Power Company:
>
> Beginning in 2025, a linear increase to a 1% incremental savings target in 2030 and maintaining a 1% incremental savings every year after.

Note that the energy savings in the VCEA is written in *total annual* savings, rather than in *incremental* savings. Translating incremental savings to total annual savings depends on how long the model assumes the efficiency measures will last. A conservative estimate would be to assume that all efficiency measures last an average of 7 years, with half the measures lasting longer than 7 years, and half lasting less than 7 years.[2]

Conclusion

The goal of decarbonizing Virginia's power sector at least cost is both challenging and highly important to achieve. The more energy savings the commonwealth can accomplish, the easier it will be for Virginia to depend solely on carbon-free energy sources. This report is an opportunity for the state to examine the extent to which energy efficiency can help Virginia achieve its carbon-free electricity goals at least cost. We ask that you take full advantage of this chance to provide deep analysis of the role that energy efficiency can play in this critical endeavor.

---

[2] Barrett, James, and Brendon Baatz. 2017. Review of *EmPOWERing Maryland: Estimating the Economic Impacts of Energy Efficiency Investments on Maryland's Economy*. American Council for an Energy Efficient Economy. March 2017. https://www.aceee.org/sites/default/files/empowering-maryland-0317.pdf.
This paper notes that residential measures have an average useful life of 7 years, while commercial and industrial measures have an average useful life of 12 years.

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Comments from Virginia Asian Chamber of Commerce to the VA Dept of Energy

1 message

mylantran@aabac.org <mylantran@aabac.org> Wed, Oct 13, 2021 at 4:38 PM
To: modeling@energy.virginia.gov
Cc: tinh.phan@aabac.org, My Lan Tran <mylantran@aabac.org>

To the Virginia Department of Energy:

For the psst 18 years, the Virginia Asian Chamber of Commerce- www.aabac.org- The Voice of Asian Businesses-has aimed to promote and facilitate the success of Asian American and Pacific Islanders (AAPI) businesses in the commonwealth. As the representative of nearly 50,000 AAPI owned business in Virginia, we understand the need and have the experience to create an environment that fosters growth for these business and, in turn, all of Virginia. One aspect of this is ensuring that AAPI Virginians have reliable, affordable energy to power their businesses because, from brick and mortar stores to offices working remote, access to electricity is a necessity. Therefore, we are in support of policies that help ensure access to this vital resource, including the Virginia Clean Economy Act and the transition to a clean energy future.

Part of this transition to a clean energy future is a phase into becoming more heavily reliant on non-carbon emitting sources. We are in favor of the environmental and economic benefits renewable energy brings bring long-term, but encourage the continued use of carbon emitting sources as we make this transition. By utilizing a mix of nuclear, offshore wind, solar and natural gas, we will reap the benefits of trusted energy sources that generate jobs and economic growth for the commonwealth, while we explore and expand clean energy technologies. Eventually, we will be able to phase into using less carbon emitting sources but we should not hasten this process, as to avoid unreliable and expensive energy costs for ratepayers, including Virginia AAPI businesses.

To that end, we look forward to the expansion of solar and wind technologies in the commonwealth. According to a study conducted by Magnum Economics on behalf of the Hampton Roads Alliance, upon completion, the Coastal Virginia Offshore Wind (CVOW) project will support 1,100 jobs annually and millions in economic growth and taxes. As the offshore wind industry develops and Hampton Roads becomes an East Coast hub for this clean energy source, this could expand even further to support 5,200 jobs annually.

The Virginia Asian of Commerce looks forward to the growth of clean energy, but wants to make clear that this should indeed be a transition from non-carbon emitting sources to support reliable, affordable energy for Virginia's AAPI business and all others.

Sincerely,

My Lan Tran, CED, CITS, CVET

Executive Director, Virginia Asian Chamber of Commerce (VACC)

VACC: The Voice of Asian American Businesses In the US Mid Atlantic

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@VAAsianChamber

HQ: Ashland, VA. Regional Offices in NOVA - Greater Richmond – 757 Region – South West Virginia

VACC: 3 times national winner of the US Small Business Administration Region III 's Champion of Minority Business for The Commonwealth of Virginia & SBA Region III (MD-DC-VA-PA-DE-WV)

VIRGINIA CHAMBER

THE VOICE of BUSINESS

October 8, 2021

Director John Warren
Virginia Department of Energy
Washington Building, 8th Floor
1100 Bank Street
Richmond, Virginia 23219

Dear Director Warren,

The Virginia Chamber of Commerce is the largest business advocacy organization in the Commonwealth with more than 28,000 members. The Virginia Chamber is in the process of developing Blueprint Virginia 2030, a comprehensive business plan that outlines the business community's priorities and recommendations for ensuring Virginia remains the best state for business. Throughout our Blueprint stakeholder engagement process, which included over 6,000 members of the business community, the top energy concern for business leaders from around the Commonwealth was access to affordable and reliable energy, followed by decarbonization.

The Virginia Chamber has long supported policies that promote energy independence and the development of a robust supply of energy. We advocate for an energy portfolio that promotes economic development and job growth through traditional and alternative energy investments. And we believe that environmental protection and energy independence are compatible and complementary goals to achieving economic growth.

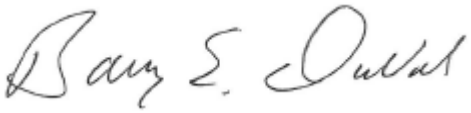
It is expected that energy consumption in Virginia will continue to rise, reflecting the increase in population, economic growth, and growing electrification of the transportation system. Therefore, to ensure a vibrant and growing economy, we must develop strategies for an ample supply of affordable and reliable energy to meet the growing needs of our population and business community.

A diverse energy portfolio that includes clean and renewable sources of energy are important to meeting our energy needs in a sustainable way. As the Commonwealth develops a plan to address greenhouse gas emissions, we encourage you to promote energy solutions and programs that capitalize on carbon-reducing innovations such as renewable natural gas, green hydrogen, advanced nuclear technology, and other promising energy developments.

A diverse energy portfolio that is reliable, affordable, and weaves in innovative solutions is important to the Commonwealth's economic competitiveness and future.

Thank you for the consideration of these comments.

Best regards,



Barry E. DuVal
President and CEO

Recommendations to Virginia's Decarbonization Goals

October 6, 2021

To: Virginia Energy (previous DMME)

Re: Decarbonization Modeling Report

Please accept these comments to Virginia Energy regarding its forthcoming report on recommendations for how to reach the Virginia Clean Economy Act's (VCEA) decarbonization goals.

Virginia Clean Energy (VCE)[1], a nonprofit organization whose mission is to accelerate the expansion of clean and renewable energy via Community Choice Aggregation (CCA) in Virginia, has been educating stakeholders and the public about the viability of Community Choice Aggregation (CCA), also called Municipal Aggregation, as an effective and faster way to achieve decarbonization at the city and county level, which would also support achieve the overall energy and sustainability goals in Virginia.

CCA is a tool that allows counties, cities, and municipalities to aggregate electrical energy load of residential, commercial, and industrial retail customers within their boundaries and select the delivered energy mix for their community by allowing localities to access the wholesale energy market directly. This establishes competition for energy supply. VCE believes it could be a significant opportunity for cities and counties to access cost-competitive renewable energy, create new and green jobs, and develop renewable energy solutions at the local level, beyond the requirements on the incumbent utilities as prescribed by the VCEA. CCA programs allow municipalities to define their power mix, for instance 50% and 100% renewable have been implemented in other states. The incumbent utility is responsible for billing, transmission and distribution, and the regulatory status is unchanged. Following the success of CCA programs in many cities and counties in California, Illinois, Ohio, Massachusetts, New Jersey, New York, and Rhode Island, we would like Virginia to embrace this unique opportunity that would support its long-term efforts to:

1. **Achieve decarbonization**
2. **Generate more local energy from renewable energy sources**
3. **Advance energy efficiency measures**

According to a 2018 legal study performed by the University of Virginia's Environmental Law Clinic, CCA is already legal in Virginia. The legal study looked closely at Sections 56-589 and 56-577 of the Virginia Code. VCE also produced a report on the feasibility of CCA in Arlington County, and found that Arlington could achieve its carbon reduction goals by implementing CCA faster than the incumbent utility. The reports are available by request or at: https://www.virginiacleanenergy.org/projects.html

[1] https://www.virginiacleanenergy.org/

To achieve full decarbonization, Virginia would need to look at different energy sources other than fossil fuels. VCE recommends Virginia Energy to consider emerging technologies[2] and policy options[3] in the modeling scenarios for the Electricity Generation in Virginia through 2040[4].

Conclusions and Recommendations

Community Choice Aggregation has already been a success across America. The program is perhaps the most important tool cities and local governments can use to promote efficiency, resiliency, and sustainability, and works in providing residents and businesses with more renewable energy at stable and competitive prices. Including provisions and support for Community Choice Aggregation as an alternative energy model to transition towards more sustainable energy and meet planned energy and environmental goals, is one of the best ways for Virginia to move faster towards more clean and renewable energy, and reduce GHG emissions in a big way.

VCE strongly encourages Virginia Energy to include and prioritize CCA as an important strategy to meet Virginia's decarbonization goals. We look forward to providing you with more background information on CCAs as needed.

Sincerely,

The Board of Virginia Clean Energy

Silvia Zinetti
Morris Meyer
Mike Sandler
Ken Hughes

[2] e.g., green Hydrogen https://www.iea.org/reports/the-role-of-low-carbon-fuels-in-the-clean-energy-transitions-of-the-power-sector?fbclid=IwAR156DGQ9l7gZmdWrzjsDRzEswm5eI-REG2qB4vvlDur8mujjRy5vXE7qfA

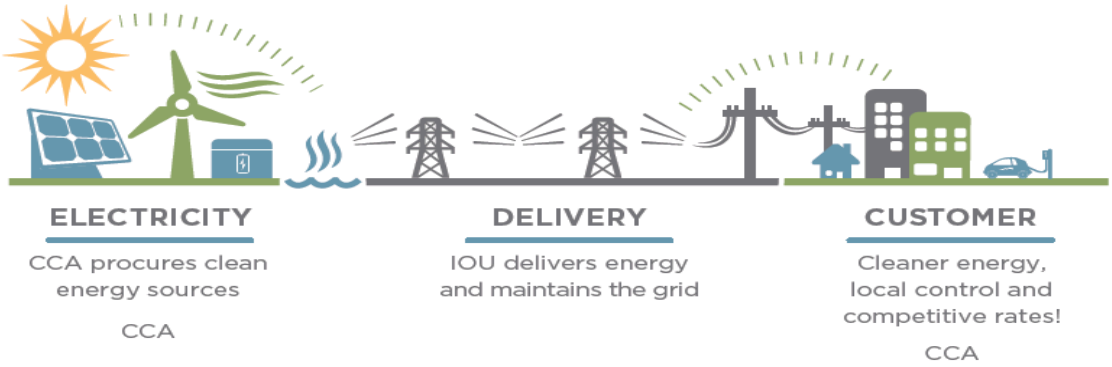
[3] e.g., carbon tax https://www.worldbank.org/en/news/feature/2015/05/11/decarbonizing-development-zero-carbon-future; https://www.scientificamerican.com/article/carbon-dividends-a-win-win-for-people-and-for-the-climate/

[4] See for instance the chart from DMME presentation, slide 15

Annex I

Community Choice Aggregation, or Municipal Aggregation

Community Choice Aggregation (CCA), also known as municipal aggregation, are programs that allow counties, cities, and local governments to procure power on behalf of their residents, businesses, and municipal accounts from an alternative supplier while still receiving transmission and distribution service from their existing utility provider.



CCAs are an attractive option for communities that want more local control over their electricity sources, more green power than is offered by the default utility, and/or lower electricity prices. By aggregating demand, municipalities gain leverage to negotiate better rates with competitive suppliers and choose greener power sources.[5]

Virginia code 56-589 allows municipal aggregation since 1999.[6] The code was amended and reenacted in 2007.

Common benefits of Community Choice Aggregation programs include:

- Achieve community decarbonization with reduction of Greenhouse Gas (GHG) emissions
- Increase renewable energy in the power mix (e.g., 50%, 100%)
- Provide competitive and stable electricity rates
- Create competition in the retail market
- Offer automatic enrollment, with the possibility to opt out
- Give customers a choice to opt-in for 100% renewable energy
- Save residents and businesses money on electricity bills
- Foster the economic development and support the creation of green jobs
- Promote energy efficiency
- Stimulate technological innovation
- Increase energy security and resiliency

[5] https://beta.epa.gov/greenpower/community-choice-aggregation
[6] § 56-589. Municipal and state aggregation.

In 2016, community choice aggregations sold about **8.7 billion kilowatt-hours of green power to about 3.3 million customers**.[7]

Excerpt from the 2021 policy analysis *The Power of Customer Choice in Energy: A California Case Study in Accelerating Clean Energy Transitions* published on *Journal of Science Policy & Governance*

> "In California, CCAs have become an effective policy tool at accelerating the transition to clean energy. Across the state, 182 cities and counties have become members of one of the 23 CCAs, with additional communities planning to join or form CCAs in the next few years. These **CCAs have been effective at unlocking market demand largely stifled by an investor-owned utility monopoly** by giving cities and counties greater choice and access to renewable energy. **The vast majority of these CCAs procure more renewable energy than the investor-owned utilities they compete with.** As a result, CCAs purchased 204% of the renewable energy required by the state from 2011 to 2019. By **achieving California's carbon-free energy targets more quickly than mandated**, the state benefits from a cumulatively larger reduction in greenhouse gas emissions each year. The success of CCAs in California demonstrates the power of promoting carbon-free energy at the grassroots, enabled by public, local choice in electricity supply."[8]

Existing CCAs in California offer a higher percentage of renewable energy (100%, 50%) in their electric service at competitive prices, and in only a few years have contributed, among other benefits, to local and regional renewable development, GHG emissions reduction, and local clean energy jobs creation.

Marin Clean Energy has **supported 5 000 green jobs, saved customer $68M, contributed to 200 MW of renewable energy development, and eliminated 500k metric tons of GHG** since 2010.[9] Sonoma Clean Power has saved customers $14M in only one year (2014), contributed to 90MW of renewable energy development, and reduced GHG emissions by 54,000 metric tons (2014).[10]

The New York pilot program in Westchester has **saved 110 000 residents more than $6M** since 2016, and is responsible for the largest purchase of renewable energy New York history, **saving around 216 000 tons of GHG emissions**. And as of March 2018, CCAs can include and incentivize the development of local renewable generation. Several New York municipalities are pursuing CCA to better serve their residents. [11]

Several CCAs have successfully promoted technology innovation such as cost-effective distributed generation systems, energy efficiency programs, demand-side management and demand response programs to offset annual capacity requirements, Automated Demand Response (ADR) pilot programs for electric vehicle (EV) charging stations, smart grid connected home devices, energy storage solutions, and new platforms for aggregating and scheduling load.

[7] https://beta.epa.gov/greenpower/community-choice-aggregation
[8] https://doi.org/10.38126/JSPG180211
[9] https://www.mcecleanenergy.org/
[10] https://sonomacleanpower.org/
[11] https://renewyorkcity.org/

VMA 2108 W. Laburnum Ave., Suite 230, Richmond, VA 23227

October 13, 2021

RE: VA Department of Energy - Decarbonization Plan Public Comments

To Whom It May Concern:

I am writing today to submit comments on the Commonwealth's Decarbonization Plan on behalf of Virginia's 6,750 manufacturers and suppliers.

The VMA clearly understands the 2020 Virginia Clean Economy Act (VCEA). The act establishes a mandatory renewable portfolio standard to achieve 30 percent renewable energy by 2030, a mandatory energy efficiency resource standard, and a carbon-free electric grid by 2045. The bill also declares that 16,100 megawatts of solar and onshore wind, 5,200 megawatts of offshore wind, and 2,700 megawatts of energy storage are in the public interest.

The VMA thinks that energy policies are essential for ensuring sustainable economic growth in manufacturing. We also know that an emphasis on reliable supplies at affordable prices, conservation, increased cost-effective energy efficiency technology and programs, cost effective distributed generation, strengthened infrastructure and investments in new technologies are critical. To assure future energy supplies and national energy independence, alternative energy sources must be developed along with traditional resources. But the decision to develop energy alternatives, which are not market-competitive but are found to be in the public interest by politicians, should be supported through federal and state tax incentives or general fund appropriations to the extent necessary to render them cost-competitive in monopoly energy markets.

Virginia should have rejected renewable portfolio mandates and similar energy regulation mandates, particularly the Virginia Clean Economy Act, due to its economic inefficiencies and higher costs for consumers. Virginia should fully utilize its natural and technological assets in expanding affordable, reliable, secure, and environmentally sustainable energy derived from nuclear, clean coal, oil, natural gas, renewables (e.g., solar, wind, hydro, landfill gas, biomass), combined heat & power, and all offshore/onshore wind resources (e.g., oil, gas, wind, and wave). Virginia should also have adopted a more transparent legislative process to clearly outline the economic costs and benefits to consumers prior to legislative action including State Corporation Commission protections for consumers from costs that are not competitive.

Virginia now ranks #20 for the Average Retail Electricity Price for Industrial Customers, Cents per KwH. The Virginia Clean Economy Act, as documented by the State Corporation Commission, will drive up

electricity costs by an estimated 61% for industrial customers, but the legislature was clearly instructed otherwise.

Further, the fundamental basis for these policies has been lowering carbon emissions from the electricity sector. Yet, prior to the passage of the VCEA or its companion bills making up the "Virginia Green New Deal" in the 2020 and 2021 legislative sessions, Virginia had already reduced its carbon emissions to place #15 lowest in the US in metric tons per capita. It is also common knowledge that the US overall has already met its obligations to the Paris Climate Accord. Further, the impractical goal of "zero-carbon emissions" from the electrical, transportation, and industrial sectors has never been demonstrated to be empirically measurable, impactful on climate change, or affordable.

In fact, "zero-carbon emissions" goals are an existential threat to every energy intensive trade exposed manufacturer in the Commonwealth – estimated at over 900 factories because they depend upon natural gas as a feedstock, fuel, and affordable resource for electricity generation to compete against national and global competitors.

Manufacturers are proud of their transition from other fuels and sources over the last decade that has resulted in the lowest carbon emissions, PM2.5 emissions, and energy consumption in over 20 years. Throwing away our competitive advantages in energy costs and low-carbon fuels for weather dependent energy that creates massive reliability risks, renewable energy pollution, and uncompetitive costs is a formula for economic disaster. A balanced "all of the above" energy strategy with realistic and achievable low-carbon emissions goals is needed instead of a politically motivated decarbonization plan.

Sincerely,

Brett A. Vassey

Brett A. Vassey
President & CEO

PO Box 3504
Arlington, VA 22203-0504
703-570-4234
www.virginianuclear.org

October 11, 2021

To: Virginia Energy

Re: Decarbonization Public Comment

Dear Sir or Madam,

I am writing on behalf of the Virginia Nuclear Energy Consortium (VNEC) to provide comments on the Commonwealth's plan for decarbonization. VNEC is a private, non-profit, corporation established by the Commonwealth of Virginia to study and seek ways to enhance and advance Virginia's nuclear industry. We appreciate the opportunity to provide input as an industry that currently provides 32% of Virginia's electric generation and 95% of Virginia's carbon-free energy.

Decarbonization is at the Center of the Virginia Clean Economy Act, which passed in 2020 and aims to fully decarbonize Virginia's electricity grid by 2045. Doing so will require a diverse portfolio of electric generation and energy storage facilities, including renewable resources such as wind and solar. In carrying out our mission, we are particularly attentive to the Commonwealth's goal of 100% carbon-free energy by 2045.

Achieving this goal will be no small task and to do so nuclear energy must play a significant and complimentary role alongside renewable energy. We believe that Virginia will need to utilize all available clean energy sources, including nuclear energy. Nuclear energy is a foundational component of an economically and technically feasible electrical generation structure for meeting Virginia's clean energy goal.

Nuclear facilities complement renewables by offering a proven combination of carbon-free energy and 24/7 availability. Nuclear is the only carbon-free energy source that is available without interruption. Nuclear energy, including advanced nuclear technologies under development can provide dispatchable energy to ensure load requirements. Nuclear provides timely ramping for both slow and rapid changes in demand to provide grid stability and reliability. In addition to stability and reliability, nuclear ensures power quality, including controlled frequency and balanced load. Additionally, the expected levelized cost of advanced nuclear technologies, such as small modular reactors (SMRs), is competitive with other clean energy resources.

Virginia is a prime location for next-generation reactors due to existing nuclear assets, expertise and capability. What's more, there will be opportunities for repurposing existing power generation sites that are, or are planned to be, shutdown with technologies like SMRs. The technologies provide siting flexibility and modularity, while increasing grid stability and security. All of these things will ensure that critical infrastructure is available on a 24/7 basis as needed for residential, commercial, data center, industrial, governmental, military, and community health and welfare (hospital, police, fire, rescue, etc.) needs.

The deployment of advanced nuclear technologies, such as SMRs, will also bring economic development opportunities to the Commonwealth. This includes job creation and the ability to transition the fossil fuel workforce into the nuclear field. It also opens opportunities for technology development and the expansion of existing nuclear capabilities in the Commonwealth.

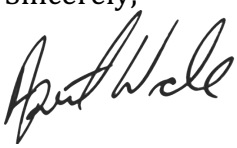
Further, inclusion of nuclear energy in any and all discussions of clean carbon-free energy is consistent with legislation passed in the 2020 legislature:

- SB 828 Carbon-free energy and clean energy; definition
- SB 817 Nuclear energy; considered a clean energy source

This legislation recognized the valuable role that nuclear is already playing in reducing Virginia's carbon emissions and directed the state to work with the energy to continue and strengthen that relationship. Our members, working with the government of the Commonwealth, developed a multi-year strategic plan to do our part to achieve Virginia's carbon goals.

Thank you for your consideration and please call on us to discuss further how nuclear energy needs to be a part of the Commonwealth's plan for reaching 100% carbon-free energy by 2045.

Sincerely,

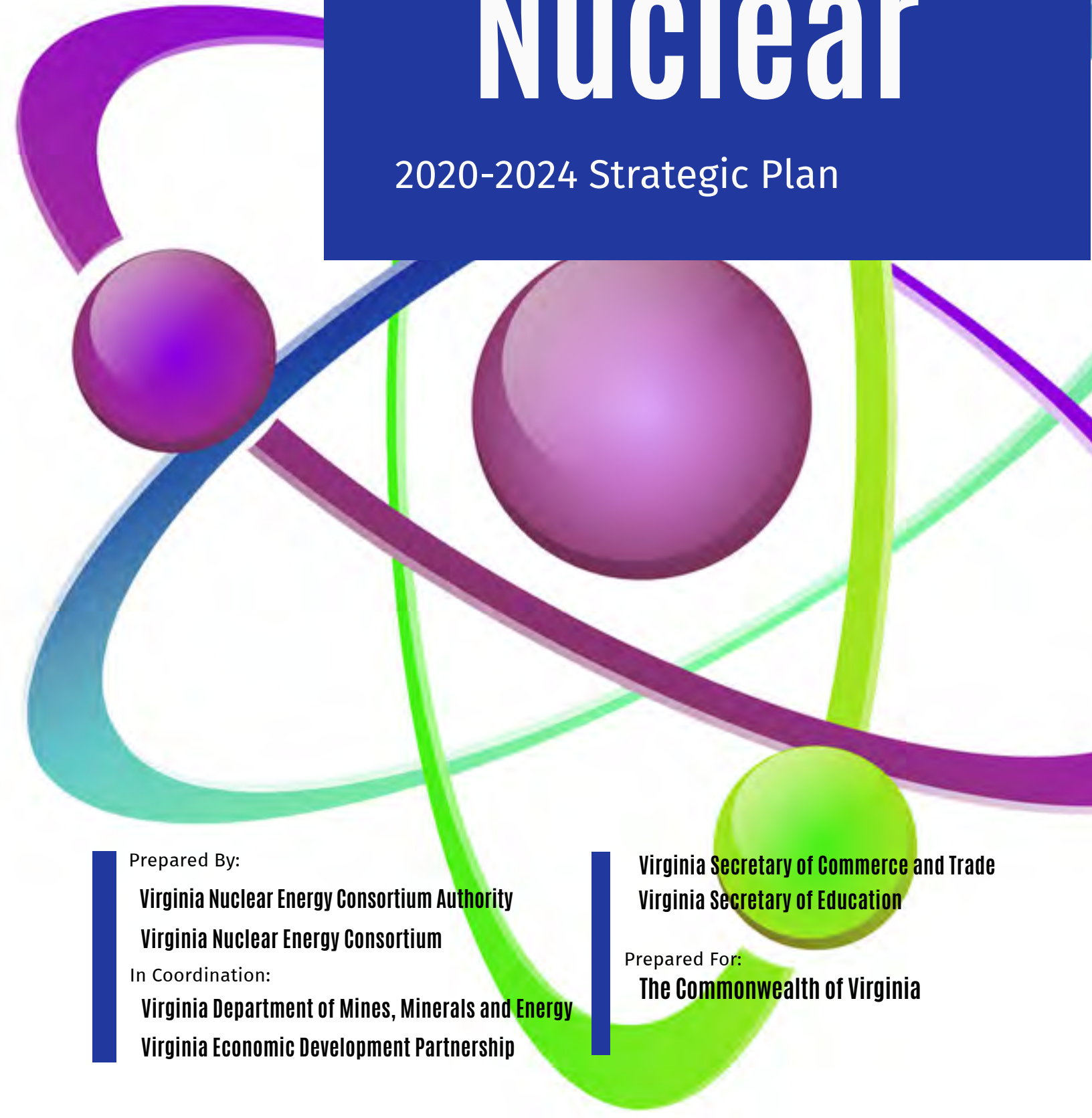


April Wade
Executive Director

Enclosure: 2020-2024 Virginia is Nuclear Strategic Plan

Virginia is Nuclear

2020-2024 Strategic Plan



Prepared By:

Virginia Nuclear Energy Consortium Authority

Virginia Nuclear Energy Consortium

In Coordination:

Virginia Department of Mines, Minerals and Energy

Virginia Economic Development Partnership

Virginia Secretary of Commerce and Trade

Virginia Secretary of Education

Prepared For:

The Commonwealth of Virginia

Virginia by the Numbers

The Commonwealth leads the industry and the nation in nuclear capability & expertise.

32%	of the Commonwealth's power coming from zero emission nuclear power.
95%	of the carbon-free energy in the Commonwealth is generated by nuclear.
5+	Research, degrees programs, and workforce training - Virginia Commonwealth University, Virginia Tech, University of Virginia, Old Dominion University, Liberty University, and community colleges.
24/7	Availability of nuclear - the only carbon-free energy source that is available without interruption.
100,000	Estimated number of jobs across the Commonwealth tied directly to the nuclear sector.
2	Federal non-nuclear facilities in Virginia are engaged in research, development and use of nuclear technology.
#1	Virginia is the prime location for next-gen reactors due to existing nuclear assets, expertise & capability.

Executive Summary

The Virginia is Nuclear 2020 Strategic Plan is a blueprint for leveraging the power of the atom for the benefit of all residents of the Commonwealth of Virginia. The principles, objectives, and near-term goals described in this plan promote economic development, environmental stewardship, and national security. The plan positions Virginia to advance its unparalleled strategic advantage in nuclear energy and related technologies.

Key guiding principles for the plan include:

- Ensuring nuclear energy's continued contribution to Virginia's carbon-free future
- Prioritizing nuclear innovation
- Leveraging existing in-state infrastructure and identify capability gaps
- Growing related educational opportunities for the future nuclear workforce

Key strategies are organized around:

- Advanced electrical generation technologies
- Economic development
- Education
- Research & development

Critical near-term objectives for 2020-2024 are:

- Developing a roadmap for the deployment of economical and technically feasible generation sources and associated energy storage technologies for meeting electricity demand profiles and carbon-free energy plan targets
- Consider a public-private partnership for siting and construction of a small modular or other advanced reactor
- To ensure that education and training programs are providing the necessary educational and work-based knowledge required to meet the demands of tomorrow's nuclear energy workforce
- Consider a generation mandate for nuclear energy if it is in the interest of the Commonwealth’s long-term clean energy targets
- Promote diversity and inclusion in STEM disciplines in order to shift patterns of representation – addressing ways to change the STEM culture to be more welcoming and inclusive of diverse cultures and backgrounds

The plan will require industry and the Commonwealth to work together to establish specific milestones for meeting the Commonwealth's 2045 carbon-free energy generation goal (§ 67-102 Commonwealth Energy Policy), and to accomplish advanced nuclear demonstration projects that will promote Virginia’s leadership in nuclear energy solutions for the world’s pressing energy, economic, environmental, and national security needs.

This plan was developed in accordance with state statute by:

Virginia Nuclear Energy Consortium Authority (VNECA)

Established by the Legislature and signed into law in 2013, VNECA's mission is to make Virginia a national and global leader in nuclear energy, science and technology, and to serve as an interdisciplinary study, research and information resource for nuclear energy in Virginia. VNECA established the Virginia Nuclear Energy Consortium (VNEC) as a non-profit corporation, responsible for conducting activities to achieve the goals set by VNECA.

Virginia Nuclear Energy Consortium (VNEC)

VNEC's mission is to sustain and enhance the Commonwealth of Virginia as a national and global leader in nuclear energy; serve as an interdisciplinary business development, research, training, and information resource on nuclear energy issues; and to advocacy for the nuclear industry.

Virginia *is* Nuclear

Virginia's nuclear industry serves a critical role in the Commonwealth, the United States, and globally as a center for nuclear technology. In diversity and strength, Virginia's nuclear capabilities are unparalleled.

Mission Statement for Virginia's Leadership in Nuclear Energy

To preserve and advance Virginia's global advantage in research, education, electrical generation, advanced manufacturing, and expertise while providing carbon-free power, innovations in nuclear technology, and defense applications to ensure national security.

Background

2020 legislation (HB 1303 and SB 549) directed the Virginia Department of Mines, Minerals, and Energy; the Secretary of Commerce and Trade; and the Secretary of Education to work in coordination with the Virginia Nuclear Energy Consortium Authority and the Virginia Economic Development Partnership Authority to develop a strategic plan for the role of nuclear energy in the Commonwealth's overall strategy for moving toward carbon-free energy.

The plan was directed to be completed by October 1, 2020, and updated every four years thereafter. The plan recognizes the industry's key priorities of maintaining, growing, and improving the Commonwealth's nuclear generation capacity through economic development, research and development, and workforce development, while maintaining Virginia's role as a world leader in nuclear capability and expertise. This plan is based upon a set of clear, guiding principles.

The facilities and expertise in the Commonwealth, combined with its proximity to the federal agencies in the Washington, DC area, position Virginia to be the nation's center for nuclear technology development.

Nuclear technology can remain a driving force in economic development, environmental stewardship, and national security, but only if we act.

Virginia is Nuclear

In diversity and strength, Virginia's nuclear capabilities are unparalleled.

Electrical Generation

- Two commercial nuclear power stations
- Four nuclear power reactors
- Operated safely over 40 years
- Generate over 95% of the Commonwealth carbon-free electricity
- Over 2,000 employees

Advanced Manufacturing and Services Capabilities

- Small modular or other advanced reactor
- Nuclear Fuel Fabrication
- Manufacturing
- Services Equipment
- Engineering Design
- Cybersecurity
- Modular fabrication
- Visualization
- Welding & Robotics
- Thermal Propulsion

Defense

- Commercial defense industry employs over 28,000
- Virginia is the home of the sole manufacturer of naval nuclear reactors for U.S. submarines and aircraft carriers
- Norfolk Naval Shipyard is the oldest naval shipyard in the United States
- Navy operates 97 reactors

Research & Development

- World-class universities including: Virginia Commonwealth University, Virginia Tech, University of Virginia, Old Dominion University and Liberty University
- NASA Langley
- Advanced manufacturing companies

Workforce

- Energy career cluster
- Community Colleges
- University degree programs
- Workforce training programs - highly skilled labor

Our Guiding Principles

On August 23, 2019, VNEC convened a forum of industry stakeholders to discuss workforce, infrastructure, and research & development as drivers of Virginia's nuclear innovation and commerce. From that discussion came a list of four guiding principles for the nuclear industry.

Ensuring nuclear energy's continued significant contribution to Virginia's carbon-free future – Maintaining its critical role in the Commonwealth's energy infrastructure during the transition to 100% carbon-free generation through the development of next-generation nuclear power.

Prioritizing nuclear energy innovation - Encouraging deployment of new technologies and economic opportunities to increase the Commonwealth's commercial nuclear infrastructure, as well as equipment and services exported around the globe.

Developing infrastructure and research & development – Establishing an energy research center and encouraging public-private partnerships between the Commonwealth and local, and federal government entities, academic institutions, and commercial entities to grow Virginia's nuclear industry.

Developing the nuclear workforce and educational opportunities – Creating programs to support innovation in the nuclear industry, and promoting education in fields that meet the future workforce demands.

Ensuring Nuclear Energy's Contribution to Virginia's Carbon-Free Future

Nuclear Energy is *CLEAN*

To meet the Commonwealth's goal of 100% carbon-free energy by 2045, it is critical for Virginia to utilize ***all*** available clean energy sources, including nuclear energy. Nuclear energy is a foundational component of an economical and technically feasible electrical generation structure for meeting Virginia's clean energy goal.

Goals

- Conduct an economic impact study on nuclear energy development and the role of the Commonwealth's nuclear fleet during the transition to 100% carbon-free energy.
- Continue operation of the Surry and North Anna nuclear stations (80-year life) which today provide more than 95% of Virginia's clean energy.
- Include nuclear energy in any and all clean energy discussions consistent with legislation passed in the 2020 legislature:
  - SB 828 Carbon-free energy and clean energy; definition
  - SB 817 Nuclear energy; considered a clean energy source
- Consider enacting legislation to establish specific milestones for meeting Virginia's 2045 carbon-free generation goal.
- Ensure nuclear energy is presented as a valuable resource for end-users in Virginia seeking to transition to carbon-free generation.
- Conduct a roadmap study of available technologies and their associated economics for meeting Virginia's 24/7 electrical demand profile while meeting established milestones for the Commonwealth's 2045 carbon-free generation goal.
  - If found in the interest of the Commonwealth, consider establishing a generation mandate for nuclear energy to ensure 2045 goals are achieved.
- Investigate pairing of advanced nuclear electricity generation with hydrogen generation for energy storage and promotion of a new Hydrogen Economy that will even further displace hydrocarbon-intensive applications and accelerate achievement of the Commonwealth's zero-carbon goal.
- Ensure new, advanced nuclear can be part of the generation mix by supporting new projects in Virginia when appropriate.
- Adopt policies that incentivize the use of zero-carbon generation – including nuclear energy – to power electric vehicle infrastructure.

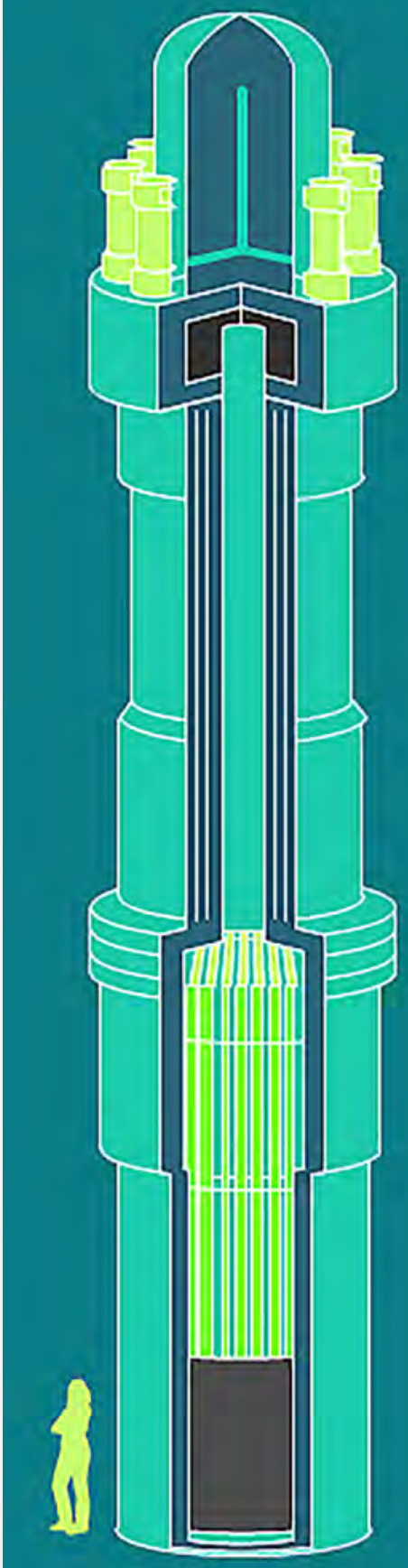
Prioritizing Nuclear Energy Innovation

Nuclear Technology is *INNOVATIVE*

Virginia can become a national leader in clean energy and advanced technological research, and at the same time reduce carbon emissions, promote economic growth, and protect the environment for future generations. Nuclear innovation has the potential to power us to Mars and beyond, and Virginia's equipment and expertise can power that innovation.

Goals

- Support federal legislation promoting the advancement of nuclear energy and related technologies.
- Provide resources for obtaining grants or financing to enhance outside funding (federal or private) for advanced nuclear energy projects, manufacturing, fuel fabrication, nuclear medicine, integrated computational materials engineering for modeling and simulations, and other nuclear-related economic development initiatives.
- Promote new projects and innovations across the nuclear energy technology spectrum, including advanced manufacturing, fuel, aerospace, medicine, and defense micro reactors, to locate in Virginia.
- Encourage companies exploring advanced nuclear generation technologies, such as molten salt, high-temperature gas, and sodium fast reactor technologies to consider Virginia as a site for pilot projects.
- Analyze available site data of potential sites for new nuclear projects, especially small modular or other advanced reactors. Particular preference should be given to areas with workers who have been displaced from other energy jobs.
- Leverage resources (universities, existing businesses, and infrastructure) within the Commonwealth to encourage the development of new business opportunities.



Department of Energy Diagram of a Small Modular Reactor

www.energy.gov/ne

Developing Infrastructure and Research & Development

Nuclear Technology is the *FUTURE*

Virginia is home to a world-class university system whose renowned research programs attract students from around the Commonwealth and around the world to complete their education in Virginia. As a global leader within the nuclear industry, Virginia is also home to companies developing the next generation of nuclear technologies, including new nuclear fuel technologies, next-generation nuclear projects, and even the nuclear technologies that have the potential to propel us to Mars.

Virginia's expertise, infrastructure, and physical/human resources can make it a global leader in nuclear technologies far into the future.

Goals

- Encourage coordination by the Commonwealth and federal officials advocating for more federal research investment in Virginia.
- Consider a public-private partnerships to establish an advanced technology project to study advanced electrical generation and energy storage technologies, including hydrogen production, and economics for meeting 24/7 the electrical demand while achieving the Commonwealth's carbon-free generation milestones.
- Encourage universities and companies to develop cooperative proposals for advanced nuclear prospects in the Commonwealth.
- Explore strategic opportunities for a new Virginia-based nuclear national lab or consolidation of select national lab functions in Virginia.

Continuing Development of the Nuclear Workforce and Educational Opportunity

Nuclear Technology is *Opportunity*

In 2018, the Virginia legislature passed legislation establishing the 17th Energy Career Cluster for the Commonwealth. Students now have the opportunity to learn about career opportunities in energy, and to focus their education on jobs that will meet the needs of the industry's growing workforce. We must continue to ensure today's education will meet the demands of tomorrow's nuclear energy workforce.

Goals

- Work with the K-12 system to include nuclear energy in Career & Technical Education (CTE) programs by supporting and promoting the newly implemented Energy Career Cluster and monitoring implementation of the 17th Cluster to ensure educational curriculum align with changes in workforce demands and next-generation nuclear jobs.
- Encourage early introduction in students' academic journeys of the career opportunities available in the energy sector.
- Encourage Virginia universities to establish full nuclear engineering programs (B.S. to PhD).
- Establish nuclear-specific workforce training and associate degree programs.
- Support University investment in advanced capabilities that meet industry educational and training needs.
- Encourage graduate education in nuclear related fields.
- Ensure students at all levels of education have opportunities to participate in big idea forums.
- Monitor the effectiveness of investment in the education and training of the energy workforce.
- Share employment opportunities in areas with workers who have been displaced from other energy jobs.
- Recognize more work must be done and take steps to foster an inclusive and diverse industry, and encourage participation in nuclear educational and professional opportunities for under-represented groups to grow and diversify the workforce.

Strategic Goals for 2020-2024

Goal: Carbon Roadmap

Developing a roadmap for deployment of economical and technically feasible electricity sources needed to meet actual electrical demand profiles and carbon-free energy plan targets.

Goal: Siting for Small Modular or other Advanced Reactor

Consider public-private partnerships for siting and construction of a small modular or other advanced reactor.

Goal: Workforce Development

To ensure that education and training programs are providing the necessary educational and work-based knowledge required to meet the demands of tomorrow's nuclear energy workforce .

Goal: Generation Targets

Establishing a nuclear energy generation target for nuclear energy if it is in the interest of the Commonwealth’s long-term clean energy goal.

Goal: Promote Diversity & Inclusion

Promote diversity and inclusion in STEM Disciplines in order to shift patterns of representation – addressing ways to change the STEM culture to be more welcoming and inclusive of diverse cultures and backgrounds.

Key Strategies

Advanced Technologies

- Prioritizing advanced nuclear energy in electrical generation planning
- Building small modular or other advanced reactors in Virginia
- Reaching the Commonwealth's goal of 100% carbon-free energy
- Utilizing the core of a small modular or other advanced reactor as a test bed for advanced fuels and materials

Economic Development

- Promoting Virginia as an ideal market for new technology development and facilities
- Promoting existing Virginia Nuclear capabilities for export
- Utilizing Virginia's ports for export of small modular or other advanced reactors

Education

- Promoting the Energy Career Cluster
- Supporting community colleges for workforce training and skilled labor
- Supporting universities for training of engineers and scientists who support the nuclear industry

Research & Development

- Promoting advanced technology research
- Developing a roadmap study for the commonwealth's carbon-free energy generation goal
- Partnering in acquiring Federal funding grants

More than 50 companies are developing Advanced Nuclear Reactors in the US backed by $1.3 billion in private capital

"The Advanced Nuclear Industry – Third Way." – Third Way, www.thirdway.org/report/the-advanced-nuclear-industry.

Commercial nuclear energy contributes more than $40 million/year per plant to the US labor market

"Jobs." Nuclear Energy Institute, 30 Apr. 2020, www.nei.org/advantages/jobs.

Annual Federal Investment in Nuclear Energy University Programs = $50+ million

"Department of Energy Invests $65 Million at National Laboratories and American Universities to Advance Nuclear Technology." Energy.gov, www.energy.gov/articles/department-energy-invests-65-million-national-laboratories-and-american-universities.

Global New Nuclear Reactor Market Growth = 15 GW/year through 2040 (IAEA projection for sustainable growth)

Iea. "Nuclear Power – Analysis." IEA, 1 June 2020, www.iea.org/reports/nuclear-power.

Projected Federal Investment in Advanced Nuclear Technology in the next 7 years = $3.2 billion

"U.S. Department of Energy Announces $160 Million in First Awards under Advanced Reactor Demonstration Program." Energy.gov, www.energy.gov/ne/articles/us-department-energy-announces-160-million-first-awards-under-advanced-reactor.

Federal Advanced Reactor Demonstration Program = $160 million/year

"It's Time for the United States to Demonstrate Advanced Reactors." Energy.gov, www.energy.gov/ne/articles/it-s-time-united-states-demonstrate-advanced-reactors-0.

Acknowledgments

BWX Technologies, Inc.
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Lightbridge Corporation
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University of Virginia
Virginia Commonwealth University
Virginia Tech
Jefferson Labs
Huntington Ingalls Industries
Virginia Nuclear Energy Consortium
Virginia Nuclear Energy Consortium Authority
Central Virginia Community College
George Washington University
ClearPath
Nuclear Energy Institute
Virginia Energy Workforce Consortium

Location of significant employers, facilities, and institutions within the Commonwealth

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Decarbonization by 2045

1 message

Alleyn Harned <aharned@vacleancities.org> Wed, Oct 6, 2021 at 4:32 PM
To: modeling@energy.virginia.gov

One significant area of carbon energy in Virginia is transportation energy source. Any decarbonization effort that ignores this area would not properly serve to decarbonize the Commonwealth's energy or economy but would only touch on the already low-emission electricity generation sector. Energy to power the Transportation energy sector comprises 48% of Virginia's carbon emissions, and is often an area where Virginia Energy has led through years through major emissions reduction projects. Transportation energy in Virginia is sourced primarily from oil, imported into Virginia from the Gulf of Mexico, or Louisiana / Texas but not locally or in other closer southern states. The cost to extract refine and distribute this fuel is high even before one accounts that each gallon of gasoline emits 20 pounds of CO2, each gallon of diesel is 25 pounds of CO2, and other harmful pollutants at the tailpipe and significant environmental challenge is caused to disadvantage communities through this energy source. This is Virginia's highest cost energy sector at nearly $50 million every day. The Commonwealth of Virginia and Virginia Energy have led with the leadership of Robin Jones, and Al Christopher, and the designated U.S. Department of Energy Clean Cities Coordinators in Alleyn Harned and Matt Wade who are state employees based at James Madison University. Virginia could choose to bolster decarbonization of this critical area of action by allocating state financial resources into Virginia Energy for the effort, which would enable Virginia Energy's partnership with Virginia Clean Cities to bring additional federal funds to Virginia and to accomplish greater emission reductions work.

There are several areas where Virginia's largest cost energy sector, transportation, can decarbonize. This is detailed in thousands of pages of federal documents at the Alternative Fuel Data Center and National Laboratories, and includes an increase in vehicle efficiency, and fuel replacements for government, business, and personal vehicles. Solutions exist today to increase vehicle and driver efficiency, and to ease down emissions with the replacement of imported oil with lower or zero-emission energy sources domestically including biofuels (ethanol, biodiesel, renewable diesel, renewable natural gas, and renewable propane) , lower carbon gaseous fuels, and low carbon energy in electricity or hydrogen. These alternative fuels represent an energy switch to decreased, zero, and net-negative carbon sources that can be accomplished today. All of these technologies and fuels have been vetted rigorously by federal laboratories and represent real technology integration options. As manufacturers develop and deploy new zero-emission vehicles that meet the duty cycles of fleets there will be additional opportunities for the state to invest in decarbonization. This coming technology integration will necessitate the development of new fueling and maintenance infrastructure to service this new clean fuel equipment.

This technology should not be accessible only to some Virginia communities but should be accessible to all, with a highly skilled workforce trained to build and maintain this refueling and service equipment and complementary energy replacements in the renewable sector.

One but not the only technology is electricity for transportation. The cost of electricity as a motor fuel is approximately one-third the cost of gasoline in Virginia, as that power is produced from a range of less expensive renewable and declining-carbon sources. While the Commonwealth currently has high acquisition cost and high taxes/ fees on electric vehicles, there is a significant opportunity to make those vehicles affordable, and to link the expansion of infrastructure with reduced cost or free community solar installations (a $.30 / kwh net-solar /wind community scale charging bank would be the fuel same cost as retail gasoline, and that technology price per kwh or lower costs is achievable this decade at scale with

technology today and incoming technology). Virginia should incentivize these vehicles, incentivize the fueling infrastructure, and incentivize the community clean fuel transition by 2045.

In the interim, the Commonwealth can decarbonize the transportation sector with a range of clean fuel technologies and should consider a range of technology operations based on national and peer-state science for reduced carbon intensity, net-zero carbon, and negative carbon outcomes.

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Nuclear Energy

1 message

Charles Meyers <cmeyers757@gmail.com> Mon, Oct 11, 2021 at 7:06 PM
To: modeling@energy.virginia.gov

To Whom It May Concern;

My name is Charles, and I am from Virginia Beach. I am writing today in support of nuclear energy. I spent years working on carriers, all of which were nuclear powered by A1B reactors. I know folks are often scared when they hear about nuclear energy, but I think if the general public knew that the US military trusts it to power our fleet and protect our sailors, they would feel better. All of our troops rely on nuclear power everyday. It is a safe and clean source of energy. Virginia should look to expand the use of nuclear energy.

Thank you,

Charles Meyers

USN retired, Virginia Beach

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Decarbonization Model Recommendations

31 messages

William Welkowitz (bwelkowitz@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:18 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

- The cost of financing targeted investments in frontline communities affected by air pollution from electric generation facilities; to try to ameliorate and eliminate the pollution impact
- The cost of providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy
- The cost of offsetting the regressive effects of increased electricity prices in low-income households

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Thank you!

Sincerely,

William Welkowitz
1600 S Eads St Apt 526N
Arlington, VA 22202
bwelkowitz@gmail.com
(818) 439-4978

Loralee Clark (loraleeclark13@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:21 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Loralee Clark
3616 Nelms Lane
Williamsburg, VA 23185
loraleeclark13@gmail.com
(757) 258-3254
[Quoted text hidden]

Vernon Savage (v1savage@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:24 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Vernon Savage
110 Suburban Pkwy Apt 201
Norfolk, VA 23505

v1savage@yahoo.com
(904) 472-5592
[Quoted text hidden]

Bill Staley (ws9811@earthlink.net) Sent You a Personal Message Thu, Oct 7, 2021 at 6:28 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Bill Staley
21930 Greentree Ter
Sterling, VA 20164
ws9811@earthlink.net
(808) 268-9836
[Quoted text hidden]

Gene Whitaker (genewhit@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:30 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

You know it is the right thing to do.
Just DO IT !

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Gene Whitaker
11270 Whitbrook Ln
Orange, VA 22960
genewhit@gmail.com
(540) 748-4973
[Quoted text hidden]

Martha Owen (owenmb@hotmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:32 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

You know it is the right thing to do.
Just DO IT !

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Martha Owen
1808 Duke of York Quay
Virginia Beach, VA 23454

owenmb@hotmail.com
(757) 754-4597
[Quoted text hidden]

Vernon Savage (v1sava@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:33 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Vernon Savage
1808 Duke of York Quay
Virginia Beach, VA 23505
v1sava@yahoo.com
(904) 472-5592
[Quoted text hidden]

Bryan Ramirez (bryanr0213@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:36 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Bryan Ramirez
1400 S Joyce St Apt 308
Arlington, VA 22202
bryanr0213@gmail.com
(631) 942-1262
[Quoted text hidden]

Stanley Naimon (snaimon@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:38 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Stanley Naimon
13111 Glenmeadow Ct
Midlothian, VA 23114
snaimon@yahoo.com
(804) 464-2409
[Quoted text hidden]

Karen Gavidia (kgav74@aol.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:40 PM
<kwautomail@phone2action.com>

To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Karen Gavidia
7017 Bedrock Rd
Alexandria, VA 22306
kgav74@aol.com
(703) 850-6847
[Quoted text hidden]

Michael Carter (avndoc@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:43 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

your model is flawed and must be rethought to include aspects that are expressed herein. think!

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Michael Carter
6830 Silver Ln
Annandale, VA 22003
avndoc@gmail.com
(703) 642-2740
[Quoted text hidden]

Karen Fostel (vizarian11@aol.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:44 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Karen Fostel
809 Byrd St
Lynchburg, VA 24504
vizarian11@aol.com
(434) 555-8585
[Quoted text hidden]

Susan Bradshaw (slbrad711@hotmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:47 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

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Thank you!

Sincerely,

Susan Bradshaw
7401 Eastmoreland Rd Apt 223
Annandale, VA 22003
slbrad711@hotmail.com
(703) 462-8548
[Quoted text hidden]

A J (gumbie@cox.net) Sent You a Personal Message <kwautomail@phone2action.com> Thu, Oct 7, 2021 at 6:49 PM
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

A J
3245 Hastings Rd
Roanoke, VA 24018
gumbie@cox.net
(540) 400-0558
[Quoted text hidden]

Raymond Nuesch (renuesch@hotmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:52 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Raymond Nuesch
4555 Catterton Rd
Free Union, VA 22940
renuesch@hotmail.com
(434) 973-5992
[Quoted text hidden]

Jennifer Yarrington (gemma_ninnie@hotmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:55 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Jennifer Yarrington
11 Bayview Ct
Hampton, VA 23664
gemma_ninnie@hotmail.com
(757) 775-6138
[Quoted text hidden]

Erika B (csoszi99@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:57 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Erika B
PO Box 999
King George, VA 22485
csoszi99@yahoo.com
(717) 275-4175
[Quoted text hidden]

Travis Allen (travisallen2000@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 6:59 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Travis Allen
3655 US Highway 211 E
Luray, VA 22835
travisallen2000@yahoo.com
(608) 575-0994
[Quoted text hidden]

Ann Creasy (ann.creasy@sierraclub.org) Sent You a Personal Message Thu, Oct 7, 2021 at 7:01 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

- The cost of financing targeted investments in frontline communities affected by air pollution from electric generation facilities; to try to ameliorate and eliminate the pollution impact
- The cost of providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy
- The cost of offsetting the regressive effects of increased electricity prices in low-income households

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We also recommend the banning of new fossil fuel-based electric generation facilities. The Chickahominy gas power plant should not be included in the model. There is no warranty that this proposed plant would be built. It has not secured a fracked gas provider yet. If we are including this proposed gas power plant we need to include the cost of health-related illness in the surrounding population that is going to be affected by the pollution generated by this facility.

Thank you!

Sincerely,

Ann Creasy
801 Boush St Ste 200
Norfolk, VA 23510
ann.creasy@sierraclub.org
(757) 513-2844
[Quoted text hidden]

Marjorie Leach-Parker (mleachparker@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:03 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Marjorie Leach-Parker
2061 Lyndora Rd
Virginia Beach, VA 23464
mleachparker@yahoo.com
(757) 581-6365
[Quoted text hidden]

Marjorie Leach-Parker (mleachparker@yahoo.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:08 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

[Quoted text hidden]

Paula Chow (paulachow132@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:10 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Paula Chow
132 Caroline St
Fredericksburg, VA 22401
paulachow132@gmail.com
(540) 310-0735
[Quoted text hidden]

Anne Baker (abbaker54@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:12 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Anne Baker
2060 Vaughan Rd
Virginia Beach, VA 23457
abbaker54@gmail.com
(757) 721-0558
[Quoted text hidden]

Marvin Wingfield (marvick2@comcast.net) Sent You a Personal Message Thu, Oct 7, 2021 at 7:14 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Marvin Wingfield
4701 Doyle Ter
Lynchburg, VA 24503
marvick2@comcast.net
(434) 384-5645
[Quoted text hidden]

Cynthia Howell (cynthia_howell@hotmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:16 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Cynthia Howell
20200 Center Brook Sq
Sterling, VA 20165
cynthia_howell@hotmail.com
(571) 434-1234
[Quoted text hidden]

Peter Yadlowsky (pm@yadlowsky.us) Sent You a Personal Message Thu, Oct 7, 2021 at 7:17 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Peter Yadlowsky
105 Perry Dr
Charlottesville, VA 22902
pm@yadlowsky.us
(434) 242-0874
[Quoted text hidden]

Caroline Fleet (cflee5739@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:21 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Caroline Fleet
1234 Misty Hills Cir
Blacksburg, VA 24060
cflee5739@gmail.com
(540) 494-8359
[Quoted text hidden]

Bridget Baiss (bbaissh@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:23 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

What would we all do if it was our mom, our cousin, our best friend, our child's teacher if they lived in an area that was more impacted than ourselves didn't get this aid? We would care. It's just a matter of time before we all know more and more close people in this boat so why not act now? Or what?

To Members of the Virginia Department of Energy,

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percent carbon-free generation by 2045.

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Thank you!

Sincerely,

Bridget Baiss
1803 Great Falls St
McLean, VA 22101
bbaissh@gmail.com
(206) 779-6049
[Quoted text hidden]

Becky Daiss (beckydaiss@verizon.net) Sent You a Personal Message Thu, Oct 7, 2021 at 7:26 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Becky Daiss

1276 N Wayne St Apt 1128
Arlington, VA 22201
beckydaiss@verizon.net
(703) 528-9538
[Quoted text hidden]

Mary Finlay (rabthop@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:28 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Mary Finlay
2835 Burrland Ln
The Plains, VA 20198
rabthop@gmail.com
(803) 446-5029
[Quoted text hidden]

Judy Gayer (jsgayer@gmail.com) Sent You a Personal Message Thu, Oct 7, 2021 at 7:29 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

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Thank you!

Sincerely,

Judy Gayer
1835 Macarthur Dr
McLean, VA 22101
jsgayer@gmail.com
(703) 448-9353
[Quoted text hidden]

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Decarbonization Model Recommendations

8 messages

Robert Reed (rreed@va.metrocast.net) Sent You a Personal Message Wed, Oct 6, 2021 at 3:59 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Robert Reed
72 Stoney Dr
Hardyville, VA 23070
rreed@va.metrocast.net
(804) 776-0310

Marilyn Clark (ramjclark@cox.net) Sent You a Personal Message Wed, Oct 6, 2021 at 4:53 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Marilyn Clark
101 Cedar Rock
Williamsburg, VA 23188
ramjclark@cox.net
(757) 565-1942
[Quoted text hidden]

Bonnie Farmer (bnb93@mac.com) Sent You a Personal Message Wed, Oct 6, 2021 at 6:51 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Bonnie Farmer
5913 Ambassador Way
Alexandria, VA 22310

bnb93@mac.com
(999) 999-9999
[Quoted text hidden]

Dragutin Cvijanovic (dragutin.cvijanovic@gmail.com) Sent You a Personal Message Wed, Oct 6, 2021 at 7:00 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

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Thank you!

Sincerely,

Dragutin Cvijanovic
11917 Saint Johnsbury Ct
Reston, VA 92116
dragutin.cvijanovic@gmail.com
(571) 215-7568
[Quoted text hidden]

Marjorie Baker (marjdbaker@yahoo.com) Sent You a Personal Message Wed, Oct 6, 2021 at 8:04 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Marjorie Baker
4411 Green Acres Pkwy
Portsmouth, VA 23703
marjdbaker@yahoo.com
(757) 673-0876
[Quoted text hidden]

Deedee Tostanoski (ddtmagnolia@gmail.com) Sent You a Personal Message Wed, Oct 6, 2021 at 9:44 PM
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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- The cost of offsetting the regressive effects of increased electricity prices in low-income households

Not including these factors in the modeling will give us an unrealistic financial cost of becoming carbon-free. The previously mentioned factors are real and the cost will have to be absorbed by the state if we don?t include them in the current modeling. The minority-majority populations will continue bearing the heaving burden of carbon emissions including a shorter life expectancy.

We also recommend the banning of new fossil fuel-based electric generation facilities. The Chickahominy gas power plant should not be included in the model. There is no warranty that this proposed plant would be built. It has not secured a fracked gas provider yet. If we are including this proposed gas power plant we need to include the cost of health-related illness in the surrounding population that is going to be affected by the pollution generated by this facility.

Thank you!

Sincerely,

Deedee Tostanoski
400 Madison St
Alexandria, VA 22314
ddtmagnolia@gmail.com
(703) 548-9060
[Quoted text hidden]

Morgan Blade (earthessence333@me.com) Sent You a Personal Message Thu, Oct 7, 2021 at 1:31 AM
<automail@knowwho.com>

To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

- The cost of financing targeted investments in frontline communities affected by air pollution from electric generation facilities; to try to ameliorate and eliminate the pollution impact
- The cost of providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy
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Thank you!

Sincerely,

Morgan Blade
222 Dusty Rock Rd NW
Riner, VA 24149
earthessence333@me.com
(540) 763-2012
[Quoted text hidden]

John Kasper (jkcr3435@aol.com) Sent You a Personal Message
<automail@knowwho.com>
To: modeling@energy.virginia.gov

Thu, Oct 7, 2021 at 11:22 AM

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

- The cost of financing targeted investments in frontline communities affected by air pollution from electric generation facilities; to try to ameliorate and eliminate the pollution impact
- The cost of providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy
- The cost of offsetting the regressive effects of increased electricity prices in low-income households

Not including these factors in the modeling will give us an unrealistic financial cost of becoming carbon-free. The previously mentioned factors are real and the cost will have to be absorbed by the state if we don?t include them in the current modeling. The minority-majority populations will continue bearing the heaving burden of carbon emissions including a shorter life expectancy.

We also recommend the banning of new fossil fuel-based electric generation facilities. The Chickahominy gas power plant should not be included in the model. There is no warranty that this proposed plant would be built. It has not secured a

fracked gas provider yet. If we are including this proposed gas power plant we need to include the cost of health-related illness in the surrounding population that is going to be affected by the pollution generated by this facility.

Thank you!

Sincerely,

John Kasper
3435 Holly Rd
Annandale, VA 22003
jkcr3435@aol.com
(703) 849-8199
[Quoted text hidden]

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Virginia Energy - Comment, By Joe James, Re Decarbonization, Per Virginia's Clean Economy Act of 2020 - 10/9/21

1 message

josephjjames <josephjjames@bellsouth.net> Sat, Oct 9, 2021 at 12:50 PM
To: Rr Decarbonization Recommendations <modeling@energy.virginia.gov>
Cc: "Hearne, Carrie" <carrie.hearne@energy.virginia.gov>

Dear Carrie:

Thanks for the opportunity to make comments, regarding decarbonization and the clean economy, as it relates to the implementation of Virginia's Clean Economy Act of 2020.

As a former 33-year economic development professional, who served in leadership positions in places like Austin, Texas, Chicago, Illinois, Prince George's County, Maryland, Richmond, Virginia, and the State of South Carolina; and now, as someone who is a clean-tech entrepreneur, I have an unique perspective and experience concerning both decarbonization and the clean economy.

First, let me make a few recommendations, and then let you know a bit about my company and how it might help decarbonize Virginia's electric utilities, as well as other sectors, even as it overcomes other challenges facing the Commonwealth.

My Recommendations:

1. Initiate a series of governmental and private sector programs to encourage the development, commercialization and deployment of technologies which decarbonize the production of electricity. For example, ask the Center for Innovative Technologies (CIT) to create a specific initiative to attract, fund and grow such startup companies. Provide additional funding to stated-based incubator and accelerator programs, to do the same.
2. Encourage electric utilities to engage the Electric Power Research Institute (EPRI), whose mission is, in part, to encourage the creation and implementation of innovative practices, in the production of electricity, to provide funding and expertise to help Virginia's utilities to demonstrate and implement decarbonization projects, in partnership with other utilities and states.
3. Encourage Virginia's universities to provide relevant R&D and other forms of assistance, to help commercialize promising technologies.
4. Encourage state agencies to brainstorm how technologies, which help promote decarbonization, might also be used to help overcome other environmental or health challenges, as a way of maximizing the impact of state spending, because it accomplishes multiple goals.
5. Give priority to decarbonization technologies, which both sequester and convert captured carbon into cost-effective bio-products, which compete in the global economy and can create jobs in Virginia.
6. To help provide a portion of the initial demand for such bio-products, use the state's procurement process to prioritize the purchase of such bio-products, as long as they are cost and functionally competitive with standard products.
7. Offer state tax incentives to encourage the development and deployment of promising technologies.
8. Encourage the federal government to implement a similar and complementary strategy, nationwide.

Overview of ATP-VA, LLC's Decarbonization & Bio-Economy Potential:

Now, as it regards to my company and its decarbonization and bio-economy potential, note the following narrative and the attachments.

Using our patented Combined Remediation Biomass and Bio-Product Production (CRBBP) Process, one plants and then multi-tasks special Bio-Crops, to cost-effectively do good things, like capturing large amounts of CO 2, remediating air, soil and water, and then making circular economy bio-products from the harvested material. We do all this for the health and well being of people, the planet, and local communities.

Our CRBBP Process' multi-tasking features share the cost of growing the Bio-Crops across multiple tasks, making the cost of each task, including CO 2 capture, the remediation of air, soil and water, and then the making circular economy bio-products, lower than it would have been, if the Bio-Crops were grown for a single purpose.

Demonstrating traction for our CRBBP Process, ATP-MD, LLC, my Maryland operating affiliate, with help from the Exelon Foundation's Climate Change Investment Initiative, is commercializing an urban application of our CRBBP Process, in Baltimore.

See: https://www.exelonfoundation.org/environment.html.

In Baltimore, we will be extracting almost 4 times the atmospheric CO 2, as an equal acreage of trees, when Biomass Sorghum is planted outdoors, to remediate brownfield sites and to provide other environmental services, and roughly 9 times as much, when Biomass Sorghum is planted in our proposed Vertical Bio-Crop Farms (VBF's), to capture CO 2 from the flue gasses of large emitters.

Also, our Virginia operating affiliate, ATP-VA, LLC, recently won the Clean Tech category of a Pitch Competition, sponsored by Dominion Energy's Innovation Center (DEIC), and has already begun planning CRBBP Process projects, in partnership with Dominion Energy.

See: http://www.dominnovation.com/deicaccelerate.

Again, thanks for the opportunity to make comments regarding decarbonization, as it relates to the implementation of Virginia's Clean Economy Act of 2020. I hope you find my comments helpful.

Let me know if I can be of any assistance.

Regards,

JJJ

Joseph J. James, President
ATP-VA, LLC
205 W. Clay Street
Richmond, Virginia 23220
Cell: (803) 413-6801
Email: josephjjames@bellsouth.net
Skype Name: josephjjames
Website: http://www.agri-techproducers.net

On Tuesday, October 5, 2021, 05:06:31 PM EDT, Hearne, Carrie <carrie.hearne@energy.virginia.gov> wrote:

Good afternoon,

You are receiving this email because you registered for the Virginia Energy presentation on decarbonization modeling, a research project and report about how Virginia's electricity generation can be 100% clean at least cost to ratepayers by 2045 (report required by the Virginia Clean Economy Act of 2020).

Virginia Energy's website has launched under the new name and branding, and as such, the location for the link on this project has changed. The new link is here below, where the presentation recording, slide deck, and instructions for submitting public comment can be found.

https://energy.virginia.gov/environmental/decarbonization.shtml

Public comment on the modeling research to-date may be submitted to modeling@energy.virginia.gov no later than this Saturday, October 9, 2021.

Should you have any questions or concerns, please reach out. Thank you for your interest in this body of work and your patience as we update our website.

Sincerely,
Carrie

Carrie Hearne
Associate Director, Energy Equity Programs
Virginia Department of Energy
Richmond, VA
Mobile: 804.393.1979
carrie.hearne@energy.virginia.gov *(new email!)*
pronouns: she/her/hers

Interested in setting up a meeting? You can schedule one here.

2 attachments

CRBBP Process US Patent No. 10,086,417 Issued 10_2_18 (1).pdf
845K

ATP_VA Pitch Deck - DEIA Presentation (2).pptx
868K

ATP-VA, LLC

Using our CRBBP Process, we plant and then multi-task very special Bio-Crops, to, less expensively, do good things for the health and well being of people, the planet and communities.

Joseph J. James, Founder & President
ATP-VA, LLC
(803) 413-6801
josephjjames@bellsouth.net

ATP-VA's Founder & President

Joe James, ATP-VA's Founder & President

Joe James' Background:

- **A former, 33-year economic development professional,**
- **A 2008 Purpose Prize winner,**
- **Served a 6-year term on the Federal Biomass R&D Technical Advisory Committee,**
- **Invented and patented ATP-VA's CRBBP Process, and licensed and patented an innovative Biomass Carbonization (Torrefaction) Process.**

Challenges: Local, National & Global

Climate Change: We need cost-effective, CO_2 capture, and carbon re-use and sequestration mechanisms.

Other Environmental Challenges: We need cost-effective ways to combat the other Environmental Challenges facing air, soil and water.

Health Challenges: We need to reduce the high levels of Airborne Particulate Matter (PM 2.5), flowing into at-risk communities, to both reduce respiratory and other diseases, as well as the severity of COVID-19 illness, in such at-risk communities.

ATP-VA's Solution: Our Patented Combined Remediation Biomass and Bio-Product Production (CRBBP) Process

Using our patented CRBBP Process, we plant and then multi-task very special Bio-Crops to, among other things, less expensively, capture lots of CO^2, and remediate contaminated air, soil and water.

We then harvest the Bio-Crops and convert the resulting Biomass, containing the Captured Carbon, into cost-advantaged, Circular-Economy Bio-Products.

Biomass Sorghum: Grows Fast, Big & Captures Lots of CO^2/Acre!!!

Standard Sorghum

Biomass Sorghum

Biomass Sorghum Captures Nearly 4 Times the Amount of CO^2 as Trees

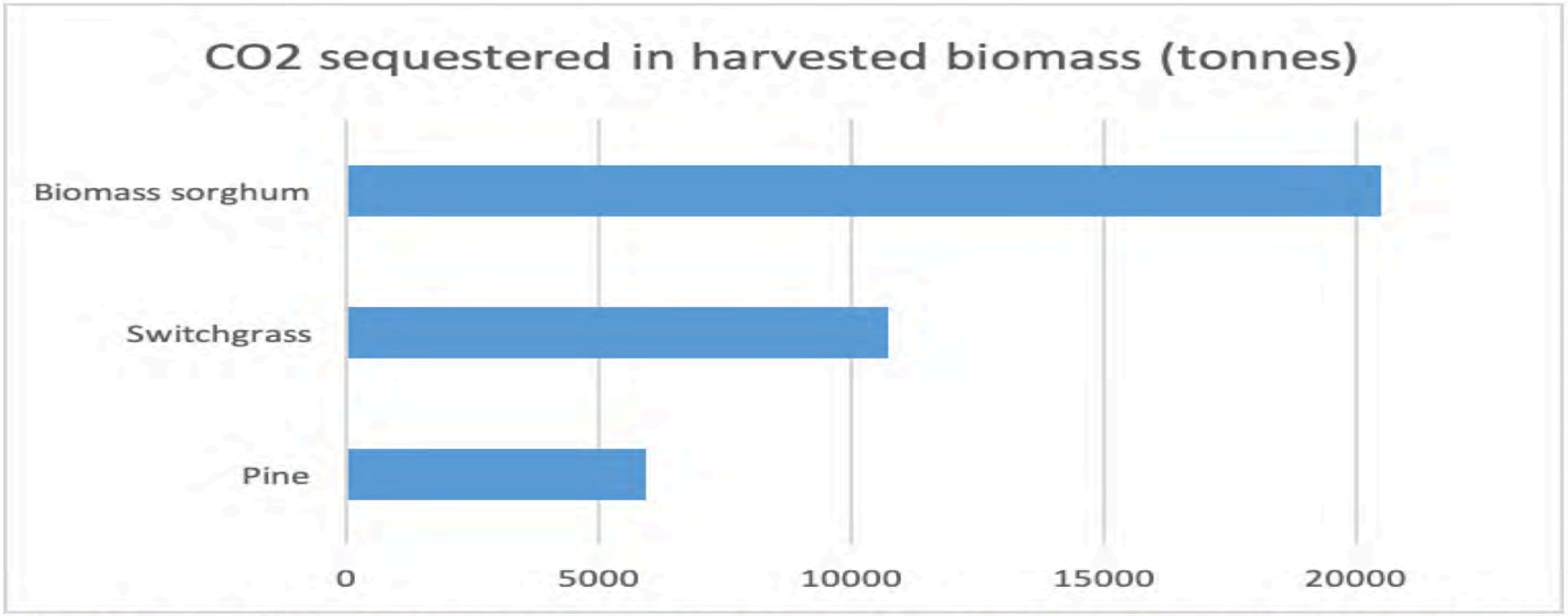


Figure 2. *Relative amounts of CO_2 captured over 15-year period from 100-acre plot of forage sorghum, switchgrass, and pine. Credit: Dr. Daniel Sanchez, University of California-Berkeley.*

Biomass Sorghum: Creates Great Pollinator Habitat On Planted Sites

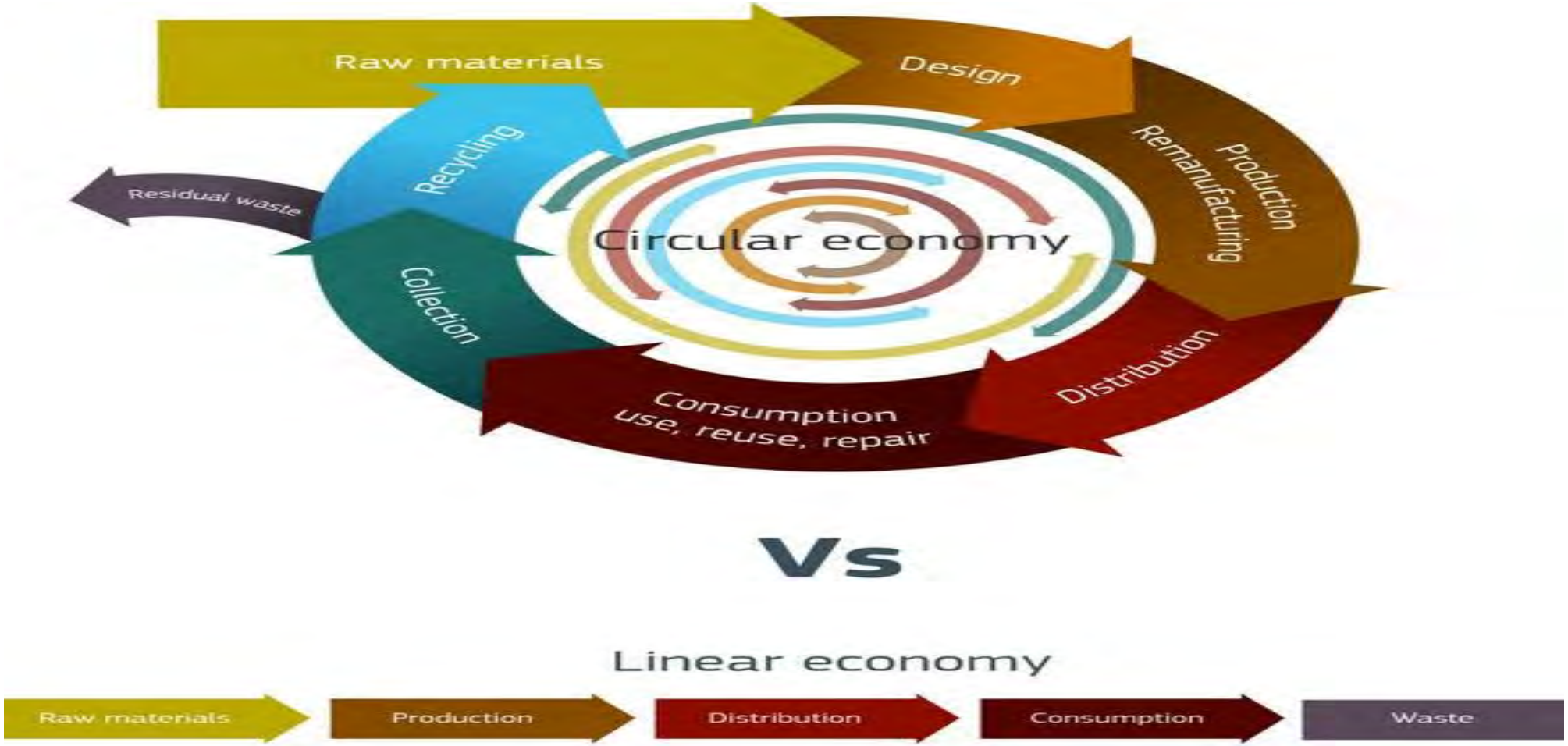
As it remediates vacant city lots our **CRBBP Process** will capture CO^2 and, also screen out **Airborne Particulate Matter** (**PM 2.5**).

It will do the same, as it remediates **Brownfields**, **Coal Ash Sites**, or extracts **Excess Nutrients** from Watershed Farm Soils.

Our Vertical Bio-Crop Farms (VBF's)Will More Than Double Our CO^2 Capture Rate

So, using VBF's We Can Also Directly Capture CO^2 From Power Plants, Other Large Emitters, as well as Mines & Transportation Tunnels, ALL YEAR ROUND!!!

ATP-VA's CRBBP Process Will Make "Circular Economy" Bio-Products



ATP-VA's Bio-Products & Markets

Superior, Carbonized, Bio-Based Filler Powders: The $380 billion US plastics and composites market (Tires, too!!!)

Superior Poultry House Bedding: The $48.3 billion US poultry market, then converting the resulting litter into…

Nutrient-Rich Biochar Soil Amendments: The $8 billion US home and garden care market (Potting Soil)

The ATP-VA Team's Outstanding Collaborators, Funders & R&D Partners

Private Sector: Dominion Energy, the **Exelon Foundation**, the **Electric Power Research Institute (EPRI)**, **Bio-Crop Seed Companies**, **F3 Tech**, Etc.

Governments: USDA: Various Grants, **USDOC**: Mid-Atlantic MBDA Mfg. Center, **State of Maryland:** MIPS Program

Universities: Univ. of Akron: Bio-Plastics, **NC State**: Torrefaction, **UMES**: Watershed, **VA Tech:** Class Project

CRBBP Process: Competitors

There are several companies, involved in CO_2 capture, and several involved, to some extent, in one or two of ATP-VA's other three, CRBBP Process solutions:

- Carbon Engineering is involved in making CO_2 capture equipment, using an expensive mechanical process. (https://carbonengineering.com/);
- Floating Islands International, Inc is involved in growing plants in water-based, remediation islands. (http://www.floatingislandinternational.com/products/biohaven-technology/); and
- Konza Renewable Fuels is involved in making and selling torrefaction equipment, used to carbonize biomass. (http://www.konzarf.com/torrefactionsystems.aspx)

ATP-VA is not aware of any companies, in an integrated, manner, utilizing more than two of the four solutions offered by our patented CRBBP Process.

Key Milestones

- **ATP's Team has successfully demonstrated our ability to extract excess Nitrogen and Phosphorus from Maryland's Chesapeake Bay watershed farm soils, to protect the Bay.**

- **ATP's Team has successfully demonstrated the efficacy of our Cost-Advantaged Bio-Products.**

- **ATP-MD, LLC, our Maryland operating affiliate, was selected, by the Exelon Foundation's Climate Change Investment Initiative, in July 2020, to commercialize an urban application of our CRBBP Process, in collaboration with Baltimore General Electric.**

- **ATP-VA, LLC , our Virginia operating affiliate, was invited into Dominion Energy's Innovation Accelerator , in May 2021.**

Potential ATP-VA/Dominion Energy Collaborations!!!

- Demonstrations Capturing CO_2 & Sequestering Carbon
- Land Remediation & Coal Ash Treatments
- Carbon Credit Acquisition & Utilization
- Vertical Bio-Crop Farm (VBF) Demonstrations
- Dominion Energy Purchases of ATP-VA Bio-Products
- Securing Federal, State, EPRI & Other Funding

ATP-VA's Financial Overview

Our Founder has provided ATP-VA with an exclusive, state-wide license to his technologies, valued at $200,000, and a $25,000 investment, in order to get the company established and functioning, in 2021.

He will work to secure an additional $150,000, in the next 12 months, to help ATP-VA begin operations in 2022. Revenues will ultimately come from providing Environmental Services and selling Bio-Products.

Financial Projections:

Year	2021	2022	2023	2024	2025
Revenues	0	50,000	125,000	375,000	700,000
Expenditures	25,000	35,000	65,000	250,000	475,000
Net Income/(Loss)	(25,000)	15,000	60,000	125,000	225,000

ATP-VA, LLC

Using our CRBBP Process, we plant and then multi-task very special Bio-Crops, to, less expensively, do good things for the health and well being of people, the planet and communities.

Joseph J. James, Founder
ATP-VA, LLC
(803) 413-6801
josephjjames@bellsouth.net

US010086417B2

(12) **United States Patent**
James

(10) **Patent No.: US 10,086,417 B2**
(45) **Date of Patent: Oct. 2, 2018**

(54) **COMBINED REMEDIATION BIOMASS AND BIO-PRODUCT PRODUCTION PROCESS**

(71) Applicant: **Agri-Tech Producers, LLC**, Columbia, SC (US)

(72) Inventor: **Joseph J. James**, Charleston, SC (US)

(73) Assignee: **Agri-Tech Producers, LLC**, Columbia, SC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/308,908**

(22) PCT Filed: **May 5, 2015**

(86) PCT No.: **PCT/US2015/029182**
§ 371 (c)(1),
(2) Date: **Nov. 4, 2016**

(87) PCT Pub. No.: **WO2015/171570**
PCT Pub. Date: **Nov. 12, 2015**

(65) **Prior Publication Data**

US 2017/0072442 A1 Mar. 16, 2017

Related U.S. Application Data

(60) Provisional application No. 61/988,632, filed on May 5, 2014.

(51) **Int. Cl.**
B09C 1/00 (2006.01)
B09C 1/10 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B09C 1/00*** (2013.01); ***A01B 79/00*** (2013.01); ***B09C 1/105*** (2013.01); ***C05D 9/00*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B09C 1/00; B09C 1/105; B09C 2101/00
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

327,256 A 9/1885 Haas
1,386,331 A 8/1921 Heckman
(Continued)

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DE 4447133 A1 7/1995
DE 4415766 A1 11/1995
(Continued)

OTHER PUBLICATIONS

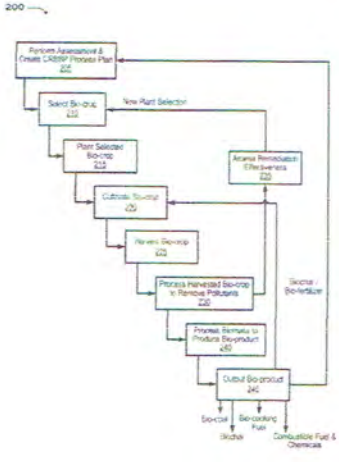
Science, Ethanol Can Contribute to Energy and Environmental Goals, 2006, vol. 311 No. 5760, pp. 506-507.

Primary Examiner — Frederick L Lagman
(74) *Attorney, Agent, or Firm* — Jeffrey T. Stover; Haynsworth Sinkler Boyd, P.A.

(57) **ABSTRACT**

A method, for mitigating an environmental condition, may include assessing a geographic area with which the environmental condition is associated; and creating a plan to mitigate the environmental condition. The plan may identify a bio-crop for mitigating the environmental condition and a bio-product to be produced from the bio-crop. The method may also include planting the bio-crop in soil that is located within the geographical area. The bio-crop may be planted in a manner that enables the environmental condition to be mitigated. The method may further include harvesting the bio-crop based on planting the bio-crop; processing the harvested bio-crop to obtain biomass; producing the bio-product based on the biomass; and outputting the bio-product based on producing the bio-product.

16 Claims, 8 Drawing Sheets



Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Comments on Decarbonization Modeling

1 message

Joy Loving <jal_1998@yahoo.com> Sat, Oct 9, 2021 at 11:39 AM
To: "modeling@energy.virginia.gov" <modeling@energy.virginia.gov>

The General Assembly's (GA) charge to VA Energy is a daunting one and the VCEA targets are very challenging, particularly when the mandate is decarbonization at "least cost to ratepayers." The requirement for a recommendation on whether "the GA should permanently ban the construction of new fossil fuel-based electric generation facilities" is less difficult to accomplish. There's simply no reason NOT to ban such construction. It's more than obvious that the world doesn't need more greenhouse gas emissions (GHG)—not only doesn't need, it absolutely can't afford them. The most recent IPCC report provides amply support for such a ban. As for the future determination of "whether implementation of the VCEA imposes a disproportionate burden on historically economically disadvantaged communities, I believe there is and will continue to be clear evidence that, under VA's current utility model, that burden will continue and likely increase.

As for the modeling approach, while there's obviously been great effort and expertise brought to bear in this effort to date, more work is needed. The contractors and UVA staff developed two questions:

1. What electricity sector emissions pathway will the existing requirements of the VCEA achieve?
   For purposes of these comments, I'm assuming that the draft responds adequately to this question
2. What additional measures, if any, are necessary to achieve the VCEA emissions goal (zero carbon emissions by 2045) at least cost (including environmental cost)?
   With respect to this question, it appears that it doesn't necessarily lead to a sufficient response to the mandate of "least cost to ratepayers." Further, without different outcomes than those projected for 2040, the model will not alleviate the good chances of "a disproportionate burden on historically economically disadvantaged communities."

Perhaps the following conclusions from the draft report are consistent with the requirements set for the modelers. If so, those requirements omitted some important considerations.

The draft:

- Does not adequately address how the "Resource Costs" satisfy "least cost" and may not provide any basis for VA Energy to issue the "disadvantaged communities" report.
- Indicates that current efforts will not allow VA to attain its 2040 goals, putting in doubt whether it can meet the ones for 2045 and 2050.
- Does not help us understand what inadequacies in the current trajectories need addressing.
- Omits alternative trajectories.
- Does not offer recommendations for policy changes.

Some potential policy areas to consider for inclusion:

-- Incorporate crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors will be needed to understand the true cost of achieving 100 percent carbon-free generation by 2045. For example, it's essential to determine the costs of …

- Financing targeted investments in frontline communities already affected by air pollution from electric generation facilities; such investments should ameliorate and eliminate the pollution impact.
- Providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy.
- Offsetting the regressive effects of increased electricity prices in low-income households, in all communities.

Not including these factors in the modeling will yield an unrealistic financial cost of becoming carbon-free. The realities and the costs of the above will have to be absorbed by the state if excluded in the current modeling. The minority-majority populations will continue bearing the heaving burden of carbon emissions including a shorter life expectancy. And so will low-income and ALICE populations that already have unacceptably high energy “burdens”.

-- Exclude the Chickahominy gas power plant, the Mountain Valley Pipeline, and other currently planned fossil fuel projects. Include banning of new fossil fuel-based electric generation facilities. Neither project is consistent with the VCEA goals; that infrastructure will become stranded assets that the owners will need to write off, in some instances costing VA ratepayers considerably. If these and other proposed fossil fuel projects are (or must be) included, then accompanying their inclusion must be the cost of health-related illness in the surrounding population that is going to be affected by the pollution generated by this facility. The implications for “least costs” and “disadvantaged communities” must be set forth clearly. “Carbon free” means addressing the social cost of pollution because that is as real and pertinent as the ratepayers’ increased charges.

-- Though clearly not requested by the GA, I would urge VA Energy to include in its policy recommendations a request to the GA to authorize further modeling to suggest ways the state can meet its VCEA goals and reduce the reliance on fossil fuel powered infrastructure such as natural gas plants (from current projections) while increasing solar. More specifically, the modeling should project how increasing distributed solar by VA residents could improve the amount of solar on the grid in 2040 above what the current projections are. Additional specific policy recommendations in this regard are removing the current caps on net metered solar and authorizing and incentivizing true, community-owned “community solar”. Further, programs such as C-PACE and Sol Smart should be ramped up, funding for pilots that the 2 clean energy/solar boards should be provided, and R-PACE and green banks to fund additional solar should be facilitated for localities or at the state level.

The links below provide some insights that might be used to improve the model’s assumptions:

https://generation180.org/decarbing-the-grid-with-solar-by-2035/?utm_campaign=GEN%20Communications&utm_medium=email&_hsmi=167769030&_hsenc=p2ANqtz-8sYjgOgskpDdVV8CYHv34xFYKKhEowd1huleWfIsnq1Ey9YvlrHDpepd1MW0oAQTIXUJ0GIsYzfKACXXw4V0qSyIKvNQ&utm_content=167769030&utm_source=hs_email

https://www.energy.gov/eere/solar/solar-futures-study?utm_campaign=GEN%20Communications&utm_medium=email&_hsmi=167769030&_hsenc=p2ANqtz-_T4riTtQD_CG5uhpQ871YRK2WXQkbxk5qRMT7alewOn5rdvuFQESjWBA3Au5-PITFeDMx_Aq-Xa7jmVLQad6O1VR_Owg&utm_content=167769030&utm_source=hs_email

I appreciate the opportunity to comment.

Respectfully submitted,
Joy Loving
9448 E Timber Ridge Rd

Grottoes VA 24441
540-421-6201

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Public Comment regarding Decarbonization

1 message

Kathleen Owens <kpowens19@gmail.com> Fri, Oct 8, 2021 at 12:39 PM
To: modeling@energy.virginia.gov

For Public Comment:

My name is Kathy Owens, and I am a small business owner from Virginia Beach. I am writing to you today to urge the Department of Mines, Minerals and Energy, now Virginia Department of Energy, to consider what is best for the success of all Virginians as we forge ahead toward a net-zero carbon emission goal.

My company, Beach Development Group, focuses on commercial real estate projects that create sustainable developments for the future. As with any small business, our success is dependent on a prosperous local economy, particularly in the aftermath of the pandemic economic downturn. A reliable and affordable supply of power is also critical to our success as well as that of our many tenants and a smart Clean Energy strategy will ensure this is the case for the future.

Currently, there are several dependable sources of power in Virginia that have already been proven to be affordable, provide uninterrupted service and accommodate economic growth. Close to one-third of Virginia's power comes from nuclear energy, and as a former Navy pilot, I have seen firsthand just how reliant our country's military is on this safe and clean energy source. Other carbon-emitting sources are significant to our success as well, with natural gas providing 60% of our power and our usage of petroleum topping that of three-fourths of states.

As we look to the future, the Commonwealth should take full advantage of investing in clean energy innovation as part of a smart Clean Energy strategy. Virginia is one of the top five states for solar energy, and right here off the coast of Virginia Beach the nation's largest offshore wind farm is being developed and is set to make us a leader in the industry. Projects like these along with the development of other innovative clean energy sources will create thousands of jobs and generate millions in economic output in a time when Virginia needs it most.

By investing in existing and future clean energy systems while also continuing with the steady production of trustworthy energy sources, our energy grid will be optimized, we will be closer to a carbon-free future, we will realize enormous economic gains and we will be protecting our numerous military installations from power interruptions that negatively affect their mission effectiveness. Virginians would benefit from using a combination of energy sources, including solar, wind, hydroelectric, nuclear, coal, and natural gas to power our homes and businesses. I urge you to create a smart Clean Energy strategy that includes a diversified grid for the benefit of us all.

Thank you,

Kathy Owens

Virginia Beach

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Public Comment Offshore Wind

1 message

Mary Thompson <mary.francis.thompson3011@gmail.com> Mon, Oct 11, 2021 at 6:40 PM
To: modeling@energy.virginia.gov

My name is Mary Thompson, and I am from Hampton. I am writing today in support of clean energy initiatives that will give all Virginians access to dependable and affordable power.

There has been a steady influx of projects in the commonwealth that indicate a focus on creating a modern and decarbonized energy grid. Here in Hampton Roads, we can see firsthand the dedication to these efforts in the Coastal Virginia Offshore Wind (CVOW) project. Set to be completed in 2026, the wind farm has the potential to power up to 660,000 homes. Virginia is also forging ahead in the solar energy industry, with new farms popping up all across the state.

I am a staunch supporter of these endeavors for a more reliable, clean future. And we thankfully have the means to begin to phase into a much cleaner energy future here in Virginia. However, as this capacity grows, we need to utilize energy from coal and natural gas, among other carbon-emitting sources, to not compromise energy quality or reliability.

The commonwealth should use a mix of energy sources to create a diversified grid that we can trust but that also spurs economic growth and clean energy. While a project like the CVOW is estimated to create 1,100 jobs for Virginians and generate $210 million in economic output annually starting in 2027, our existing industries have their own much-needed success to maintain. The natural gas and oil industries employ over 125,000 Virginians – jobs that would be lost if we made a complete switch to renewables.

We need to utilize all methods of energy production to reach peak reliability while also supporting our economic prosperity. By allowing Virginia electric utilities to continue using carbon-emitting electric generating units while also continuing to invest in clean energy alternatives, we could have it all. Sacrificing reliability for modernization would not be in the best interest of Virginia residents, and I hope that we can move forward by diversifying and improving our energy grid.

Thank you,

Mary Thompson

Hampton, Virginia

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Reliable energy in Virginia

1 message

pkallay@verizon.net <pkallay@verizon.net> Tue, Oct 12, 2021 at 8:44 PM
Reply-To: pkallay@verizon.net
To: "modeling@energy.virginia.gov" <modeling@energy.virginia.gov>

The Virginia Department of Energy should do what is best for Virginia's energy grid and economy so that Virginians can have access to reliable and affordable power while creating and protecting jobs in the process.

Virginia – and the entire country – has long relied on carbon-emitting sources for energy production, and for good reason – they are well-tested and reliable. The natural gas and oil industries employ over 125,000 Virginians, and there are nearly 3,000 coal workers in our state. These industries are economic boosters and some of the most dependable sources of energy. In addition to nuclear energy, for decades, Virginia's grid has thrived by relying on them for power.

As technology progresses and new concepts for energy production emerge, the commonwealth has rightfully begun to invest in multiple renewable energy sources in very big ways. Construction has commenced on what will be our nation's largest offshore wind farm right off the coast of Virginia Beach, which will eventually provide power for up to 660,000 Virginia homes. The solar energy sector has also been forging ahead, with new farms popping up across the state at swift rates.

While these new sources are exciting for our state and an indicator of a future of great progress, now is not the time to make a hard and fast switch. Our original energy sources are still generators of great profitability, plus they have proven to be reliable even in the toughest of times. Turning away from what is tried and true could be a detrimental decision.

As a Virginian, I am concerned. The last thing that we need in our state is a situation similar to what has occurred in Texas as a result of an energy grid that was not ample enough for the conditions that met it. While we have gotten by so far, we can never be certain that our grid will be adequate.

By implementing a more diversified grid, we can have it all: affordability, dependability, economic growth and overall prosperity. In 2021, there are several sufficient sources of energy, and by using them all to their full advantage, we are sure to succeed.

Sincerely,

Paula Kallay
Spotsylvania County

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Decarbonization Model Recommendations

2 messages

Rhonda Johnson (rdtgjohnson@hotmail.com) Sent You a Personal Message Fri, Oct 8, 2021 at 1:38 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

The decarbonization model is missing crucial factors, with financial implications, that disproportionately affect communities of color in Virginia. These factors need to be included in order to understand the true cost of achieving 100 percent carbon-free generation by 2045.

- The cost of financing targeted investments in frontline communities affected by air pollution from electric generation facilities; to try to ameliorate and eliminate the pollution impact
- The cost of providing financial assistance to workers affected by the transition away from fossil fuels (including gas), and for job training and clean energy investments in frontline communities and communities where coal and fracked gas represents a significant part of the economy
- The cost of offsetting the regressive effects of increased electricity prices in low-income households

Not including these factors in the modeling will give us an unrealistic financial cost of becoming carbon-free. The previously mentioned factors are real and the cost will have to be absorbed by the state if we don?t include them in the current modeling. The minority-majority populations will continue bearing the heaving burden of carbon emissions including a shorter life expectancy.

We also recommend the banning of new fossil fuel-based electric generation facilities. The Chickahominy gas power plant should not be included in the model. There is no warranty that this proposed plant would be built. It has not secured a fracked gas provider yet. If we are including this proposed gas power plant we need to include the cost of health-related illness in the surrounding population that is going to be affected by the pollution generated by this facility.

Thank you!

Sincerely,

Rhonda Johnson
240 Rainwater Dr
Aylett, VA 23009
rdtgjohnson@hotmail.com
(804) 769-0646

Laura Lavertu (lelavertu@gmail.com) Sent You a Personal Message Fri, Oct 8, 2021 at 2:46 PM
<kwautomail@phone2action.com>
To: modeling@energy.virginia.gov

Dear Virginia Energy,

To Members of the Virginia Department of Energy,

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Thank you!

Sincerely,

Laura Lavertu
5901 Mount Eagle Dr
Alexandria, VA 22303
lelavertu@gmail.com
(571) 205-9514
[Quoted text hidden]

Commonwealth of Virginia

Decarbonization Recommendations, rr <modeling@energy.virginia.gov>

Public comment on decarbonization:

3 messages

William Gathright <gathright@gmail.com> Thu, Sep 23, 2021 at 10:23 AM
To: modeling@dmme.virginia.gov
Cc: Cliona Mary Robb <crobb@t-mlaw.com>, "Jurman, Ken (DMME)" <Ken.Jurman@dmme.virginia.gov>

At a recent webinar on the Virginia Decarbonization plan, an audience member suggested that banning Bitcoin mining should be considered as a way to reduce emissions. Banning Bitcoin mining would be an ineffective and problematic policy. Rather than considering bans, Virginia should work with its high-tech industry to achieve the dual goals of decarbonizing and advancing our economy.

Rather than viewing Bitcoin mining as a threat to our environmental policy, Virginia should embrace this opportunity for the following reasons.

Bitcoin in particular, and blockchain technology in general, is an opportunity for vast improvements to the way Virginians conduct finance, business, democracy, and a host of other lofty goals. It should not be viewed as a frivolous curiosity for gamblers and speculators, but rather the greatest wealth creation engine available today. It is a social good and should be nurtured as such.

Banning such activities at a state or even national level will not prevent them, but merely drive them elsewhere. Much more effective is to work with Bitcoin miners to make sure they have access to the clean power they need here in Virginia, attract them to the area, and reap the economic rewards.

Bitcoin is just a single application of the broader technology. Governmental policy should not be picking technological winners and losers – that should be the job of markets.

Modern data centers use large amounts of power for many computing tasks. No sound energy policy would single out Bitcoin mining over any other energy intensive task such as, say, training a machine learning model or running a factory.

Many economically depressed portions of the state are far from large population centers but have access to clean energy resources such as solar and wind. Bitcoin mining can bring good jobs to those areas while simultaneously allowing them to develop those natural resources.

Electric loads from mining have good qualities. They are predictable, easy to value, and easy to curtail. This makes such loads ideal for baseload and demand response. Rather than a ban, we should consider demand response programs that would transform the electric load into an asset for decarbonization.

I ask that before considering any policy that might hamstring this important industry, decision makers should get a clear understanding of the technology and its implications. For any further discussion or clarification please feel free to reach out to me directly.

Cheers,
- Will

Decarbonization Recommendations, rr <modeling@energy.virginia.gov> Tue, Sep 28, 2021 at 4:53 PM
To: Carrie Hearne <carrie.hearne@energy.virginia.gov>, erik.olson@energy.virginia.gov

FYI
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Hearne, Carrie <carrie.hearne@energy.virginia.gov> Thu, Sep 30, 2021 at 8:44 AM
To: William Gathright <gathright@gmail.com>
Cc: erik.olson@energy.virginia.gov, "Decarbonization Recommendations, rr" <modeling@energy.virginia.gov>

Good morning Will,

Thank you for submitting comments for our consideration in the report on modeling decarbonization pathways to reach clean electricity by mid-century in Virginia. I will share your comments with the modeling team and we will consider them in the report on this topic regarding data center growth and Bitcoin mining.

Best regards,
Carrie

Carrie Hearne
Associate Director, Energy Equity Programs
Virginia Energy (DMME)
Richmond, VA
Office: 804.692.3234
Mobile: 804.393.1979
carrie.hearne@energy.virginia.gov *(new email!)*
pronouns: she/her/hers

Coming October 1st: DMME becomes Virginia Energy!

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