THE COMMONWEALTH OF VIRGINIA'S

2022 ENERGY PLAN

RELIABLE. AFFORDABLE. CLEAN. INNOVATIVE.

VIRGINIA DEPARTMENT OF ENERGY

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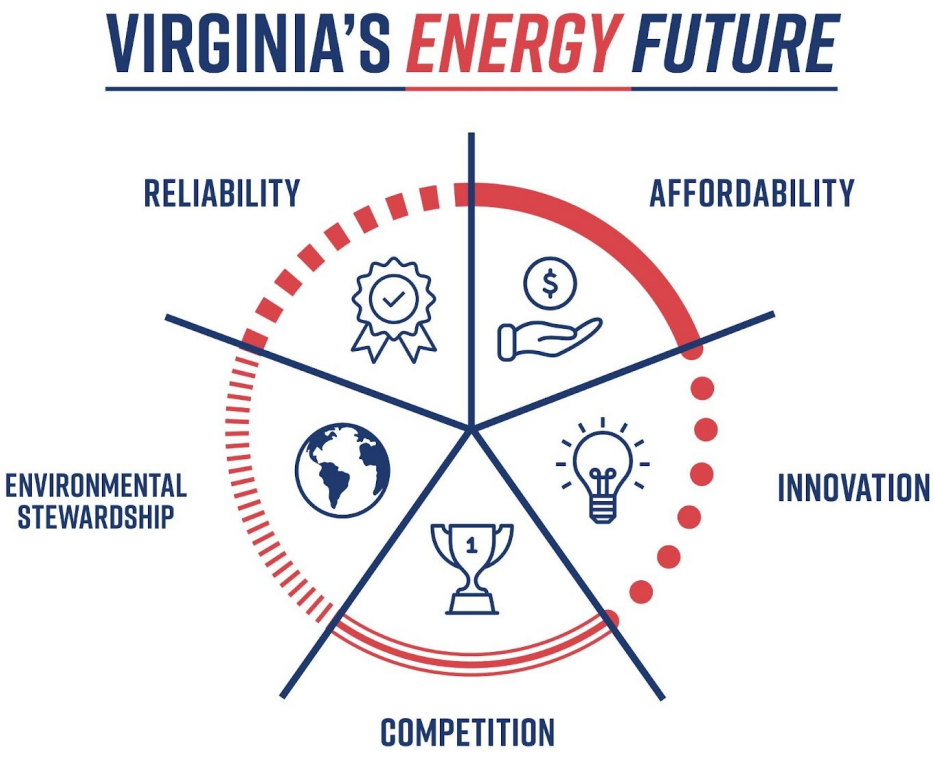
2022 VIRGINIA ENERGY PLAN

INTRODUCTION

A growing Virginia – growing population, growing businesses, growing jobs and growing economy – must prepare for the infrastructure and energy needs of tomorrow. The Commonwealth deserves an achievable plan to provide families, businesses and communities with reliable, affordable, clean and abundant energy today and in the future. Now, more than ever, Virginia needs a plan for more energy generation and reliable transmission. An "all of the above" approach that includes natural gas, nuclear, renewables and embraces innovation and emerging technologies will meet the diverse needs of the Commonwealth's residents and businesses now and in the future.

The 2022 Virginia Energy Plan (the Plan or 2022 VEP) provides an analytical assessment of the current state of the Commonwealth's energy economy, a practical approach for Virginia to base future policy decisions and a series of commonsense recommendations for policymakers and industry participants to adopt immediately. The "all of the above" approach in this Plan embraces a flexible path going forward to respond to the changing and growing demands of customers based on our guiding principles of reliability, affordability, innovation, competition and environmental stewardship.



The Plan recommends required periodic reassessments of Virginia's energy portfolio to remain current with the evolution of energy production and transmission. To manage a responsible energy transition, the Plan recognizes a necessary level of humility in predicting the future of energy needs and how to meet them.

To guarantee abundant, clean energy for Virginia's future, the Plan recommends the Commonwealth make strategic investments in innovative, emerging technologies, including hydrogen, carbon capture, storage and utilization and, particularly, small modular nuclear reactors (SMR). The Plan supports funding to initiate the goal of deploying a commercial SMR in Southwest Virginia within ten years.

This Plan also supports adding offshore wind generation to our energy mix. Certainty regarding project cost, timing, and efficiency is critical when assessing such monumental projects. Offshore wind also capitalizes on economic development opportunities for the domestic wind supply chain. Virginia must leverage its existing offshore wind leadership position, as host of the largest planned offshore wind project in the Free World and the deepest, widest and safest port on the East Coast.

The Plan advances competition within our current regulatory structure to provide customers needed flexibility and considers cumulative impacts of energy generation on the entire environment - land, water, and air.

The ultimate goal of the 2022 Virginia Energy Plan is to ensure access to reliable, affordable, clean and abundant energy so all Virginians can live, work and raise a family in a growing and thriving Commonwealth.

THE CURRENT STATE OF VIRGINIA'S ENERGY

Virginia's energy landscape is at a crossroads. The energy needs of the Commonwealth, its businesses and its families are changing – and growing. The changing energy ecosystem presents stark contrasts between the reliability of baseload generation on one hand and reduction of carbon emissions on the other. Between these dueling objectives is a debate over the relative cost to consumers of continuous baseload versus intermittent energy generation technologies. Baseload generators, like nuclear power stations and combined cycle natural gas, operate continuously and consistently over time to meet the minimum level of power demand. Intermittent generators, such as solar and wind, can only operate when conditions are right, with the sun shining or the wind blowing.

Over the past fifteen years, Virginia's energy policy has been governed by a series of legislative initiatives that reestablished a regulatory monopoly framework and enabled certain projects, with guaranteed rates of return, to be placed outside the base rates overseen by Virginia's public utility regulator, the State Corporation Commission (SCC). More recently, the Virginia Clean Economy Act (VCEA) was passed in 2020 and introduced uncertainty into the Commonwealth's energy landscape, placing additional costs on consumers and raising concerns regarding the reliability of the electrical grid, which was historically strong.

From 2010 to 2020, Virginia's energy consumption grew 2.0% from 123.8 terawatt hours (TWh) to 126.3 TWh. In 2010, Virginia generated 73.0 TWh and imported 50.8 TWh of energy (41.0% of total consumption) through excess power generated by states in Virginia's Regional Transmission Organization (RTO), PJM, which Virginia joined in 2005. Largely driven by the addition of natural gas generation facilities, Virginia has grown intrastate generation by 41% to 103.1 TWh in 2020, decreasing the level of net imports to 23.2 TWh (18.4% of total consumption), allowing Virginia to supply lower cost power instead of importing higher cost power from other states.

Figure 1. Power Generation and Consumption in Virginia (2010-2020, Terawatt hours)[1]

			NET IMPORTS	
YEAR	CONSUMPTION	GENERATION	TOTAL	%
2010	123.8	73.0	50.9	41.1%
2020	126.3	103.1	23.2	18.4%
DELTA (%)	2.0%	41.2%	-54.4%	NA
CAGR (%)	0.2%	3.5%	-7.5%	NA

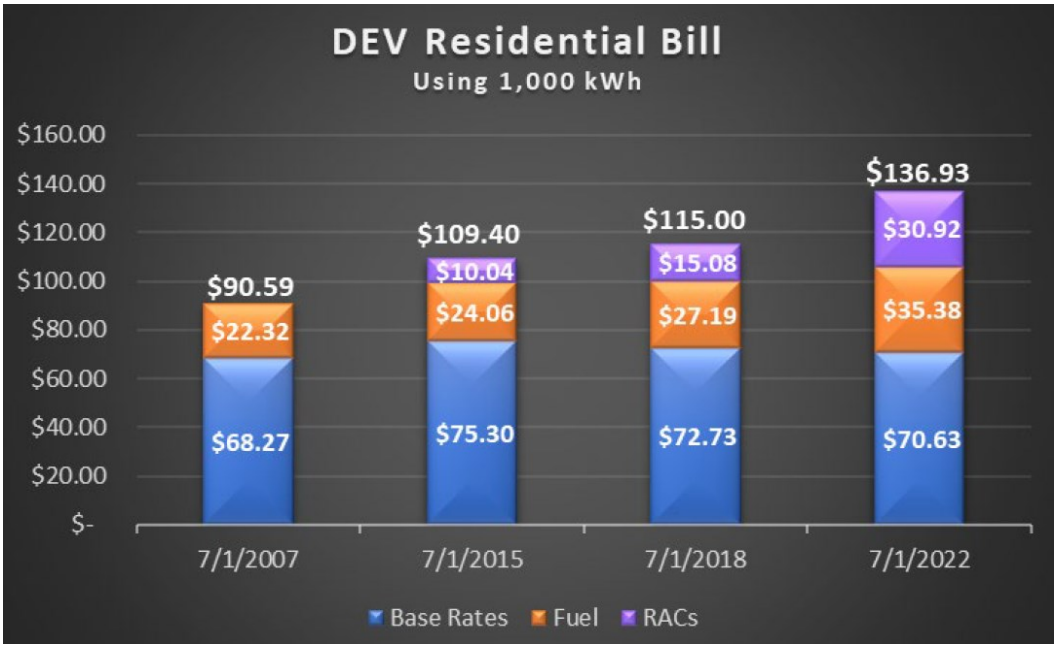
Historically, to pay for this growing capacity, the SCC set "just and reasonable" electricity rates based on cost of service plus a rate of return from which utilities can collect a prescribed profit, and customers paid for their energy usage according to "base rates." In 2007, the General Assembly passed the Re-Regulation Act, allowing utilities to request to recover certain costs outside of their base rates through rate adjustment clauses (RACs) or riders.

Since 2007, Virginia ratepayers have seen an increasing number of RACs accumulate on their monthly power bills. Combined with public interest declarations, which allow utilities to recover all project costs through rates, RACs are advantageous for utilities because they allow utilities serving as project developers to recover costs associated with riskier investments with a minimum *guaranteed* rate of return. Virginia's somewhat unique regulated utility structure may disallow independent power producers from even competing for such projects .

In fact, as shown in *Figure 2,* RACs are responsible for almost 100% of the rising electricity rates in Virginia between 2007 and 2022.

1. U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms. U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report. Form EIA-111, Quarterly Imports and Exports Report.

Figure 2. Monthly Dominion Residential Electricity Bills Since the Inception of RACs[2]



As shown in the figure below, Virginia has had a dramatic shift in electricity generation over the last 10 years. Cleaner burning natural gas went from 23% of Virginia's electricity generation in 2010 to 61% in 2022, and coal generation was reduced from 35% to 4% during the same period. [3]

Figure 3. Virginia's Electricity Generation Over Time (Terawatt hours)[4]

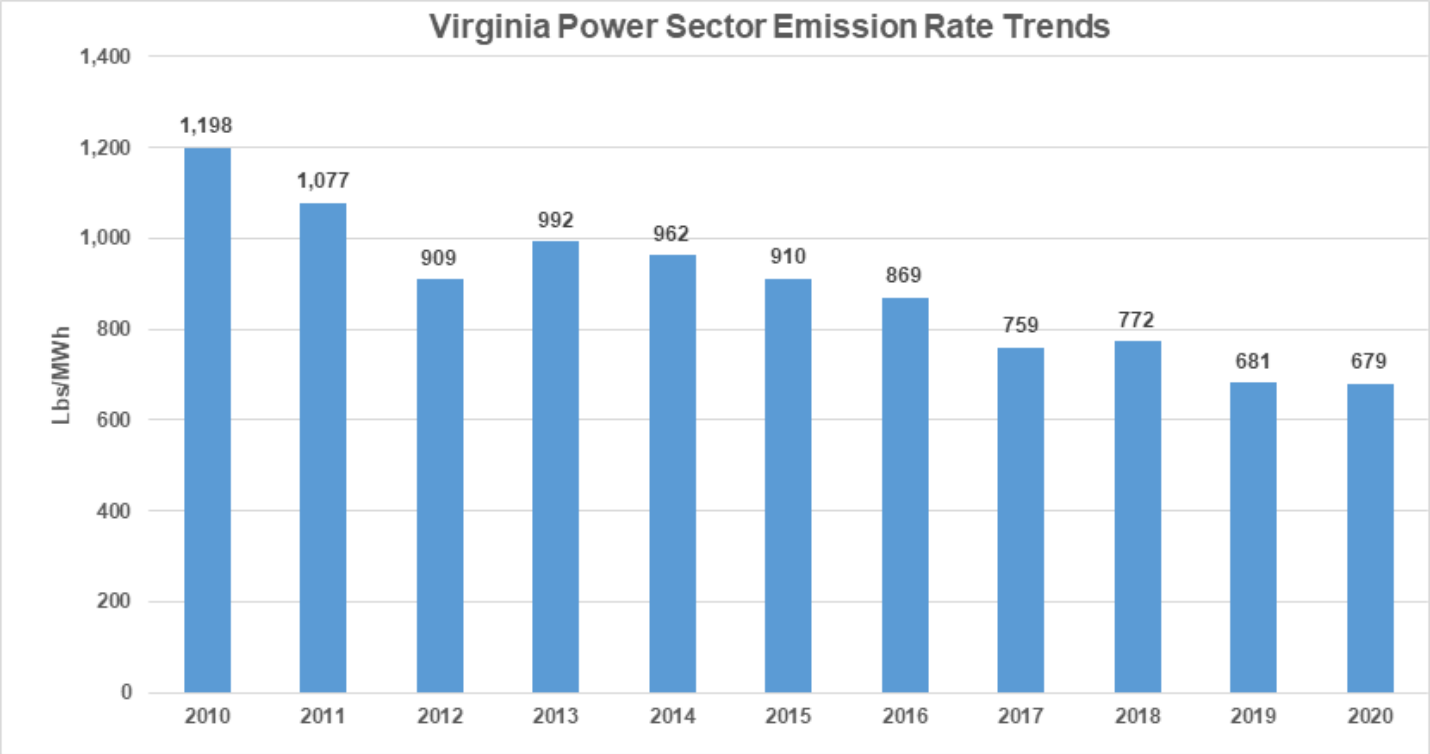
	BASELOAD/PEAKING					INTERMITTENT			
YEAR	NUCELAR	COAL	NATURAL GAS	OTHER	%	WIND	SOLAR	%	TOTAL
2010	26.6	25.5	17.0	3.9	100.0%	0.0	0.0	0.0%	73.0
2020	30.1	3.8	62.6	5.2	98.7%	0.0	1.4	1.3%	103.1
DELTA (%)	13.4%	-85.2&	268.4%	31.1%	NA	NA	NA	NA	41.2%
CAGR (%)	1.3%	-17.4%	13.9%	2.7%	NA	NA	NA	NA	3.5%

2 State Corporation Commission. Status Report: Implementation of the Virginia Electric Utility Regulation Act Pursuant to § 56596 B of the Code of Virginia. September 1, 2022.

3 and 4 Energy Information Administration. Table 5. Annual Virginia Electricity Profile Data, 2020.

The most recent U.S. Energy Information Administration (EIA) data shows Virginia's environmental progress. From 2010 to 2020, the Commonwealth reduced carbon dioxide emissions by 20%, sulfur oxides emissions by 91% and nitrogen oxides emissions by 58% primarily due to this shift from coal to lower-emission natural gas generation.[5] In particular, carbon emissions per MWh, per capita were reduced by 25% to 12.5 metric tons per capita in 2020, placing Virginia 16th in the country and fourth among the 13 states in PJM for carbon emission reductions. In fact, prior to joining the Regional Greenhouse Gas Initiative (RGGI), the Commonwealth had organically reduced its carbon emissions rate by more than 43%.

Figure 4. Virginia Power Sector Carbon Emission Rates, 2010 - 2020[6]



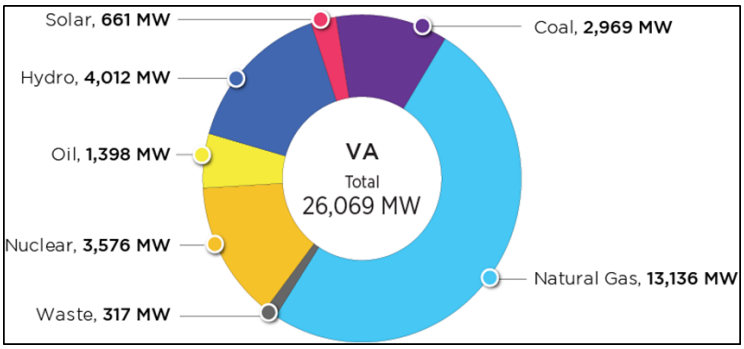
As of December 2021, the Commonwealth had 661 MW of installed wind and solar capacity. These low-cost, intermittent sources comprised 2.5% of the Commonwealth's power capacity. The majority of the Commonwealth's capacity is natural gas (50.4%) and nuclear (13.7%). Comparatively, the total capacity mix of PJM includes significantly more coal at 27% (compared to Virginia's 11%), 17% nuclear, 2% intermittent sources and 44% natural gas.

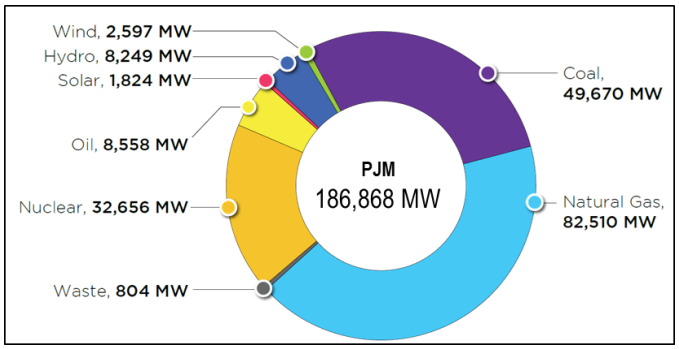
These figures are slightly different from the generation figures mentioned above, because generation accounts for the actual electricity produced by a generation asset. Generation assets are turned offline periodically for refueling, maintenance, and, in the case of intermittent sources like wind and solar, which have a much lower capacity factor due to the variability in sun and wind.

5 PJM Interconnection. PJM 2021 Infrastructure Report. Table 4. Per capita energy-related carbon dioxide emissions by state (1970–2019).

6 Energy Information Administration. Detailed EIA-923 emissions survey data - Electric power industry estimated emissions by state.

Figure 5. Comparison of Installed Capacity, Virginia vs. PJM (2021)[7]





Electricity Pricing and Affordability

Despite RAC-driven increases in monthly bills, Virginia still enjoys competitive energy prices. As of June 2022, Virginia is ranked 15th in the US for energy affordability across sectors ($0.11/kWh), specifically 21st in residential ($0.14/kWh), 19th in industrial ($0.08/kWh), and 7th in commercial ($0.09/kWh), and these energy prices place Virginia in the middle of our competitor states[8] for residential cost per kWh and 3rd for industrial costs per kWh.

Despite its current competitive pricing, the rate of increase of energy prices in the Commonwealth was the fastest among competitor states over the last 15 years – see the Affordability section below for more. From 2005-2020, energy prices for residential customers increased 47%, compared to national growth of 39% and median competitor growth of 35%. For industrial customers, the comparative growth was more distinct at 41%, compared to national growth of 30% and median competitor growth of 12%[9]. Over the same period, energy price increases also significantly eclipsed GDP growth of 16.4%[10], employment growth of 14.4%[11], and overall population growth of 14.1%. [12]

As real energy costs continue to outpace economic growth, the cost of living will further rise, negatively impacting the Commonwealth's industrial competitiveness.

This Plan also recognizes that current costs don't always represent total costs, and the Plan suggests that the lifespan of certain generation sources, nuclear (80 years), gas (30 years), and wind and solar (20-30 years), present different end of life profiles and costs. The Plan recommends that future reviews of energy projects account for the present value of end of life disposal and recycling costs.

Finally, the Plan acknowledges current dueling objectives, the cost to consumers and reducing carbon emissions, and incorporates the need for periodic reassessments that utilize technical advancements and cost-curve changes.

7 PJM Interconnection. PJM 2021 Infrastructure Report. Table 4. Per capita energy-related carbon dioxide emissions by state (1970–2019).

8Competitor states include Florida, Georgia, North Carolina, South Carolina, Tennessee and Texas. "Compared to competitors" refers to the median rate of change across the peer group.

9 Energy Information Administration. Table 8 data. Annual Virginia Electricity Profile Data, 2020.

10 Real State GDP grew by 11.5% overall between 2005Q1 and 2020Q4. Virginia Economic Development Partnership.

11 Between January 2005 and December 2020, the employment level in Virginia increased by 14.4% overall on a seasonally adjusted basis. The same statistic for December 2019 through December 2020 was -6.7%. Virginia Economic Development Partnership.

12 2005 through 2020 population growth for VA was 7.9%. Virginia Economic Development Partnership.

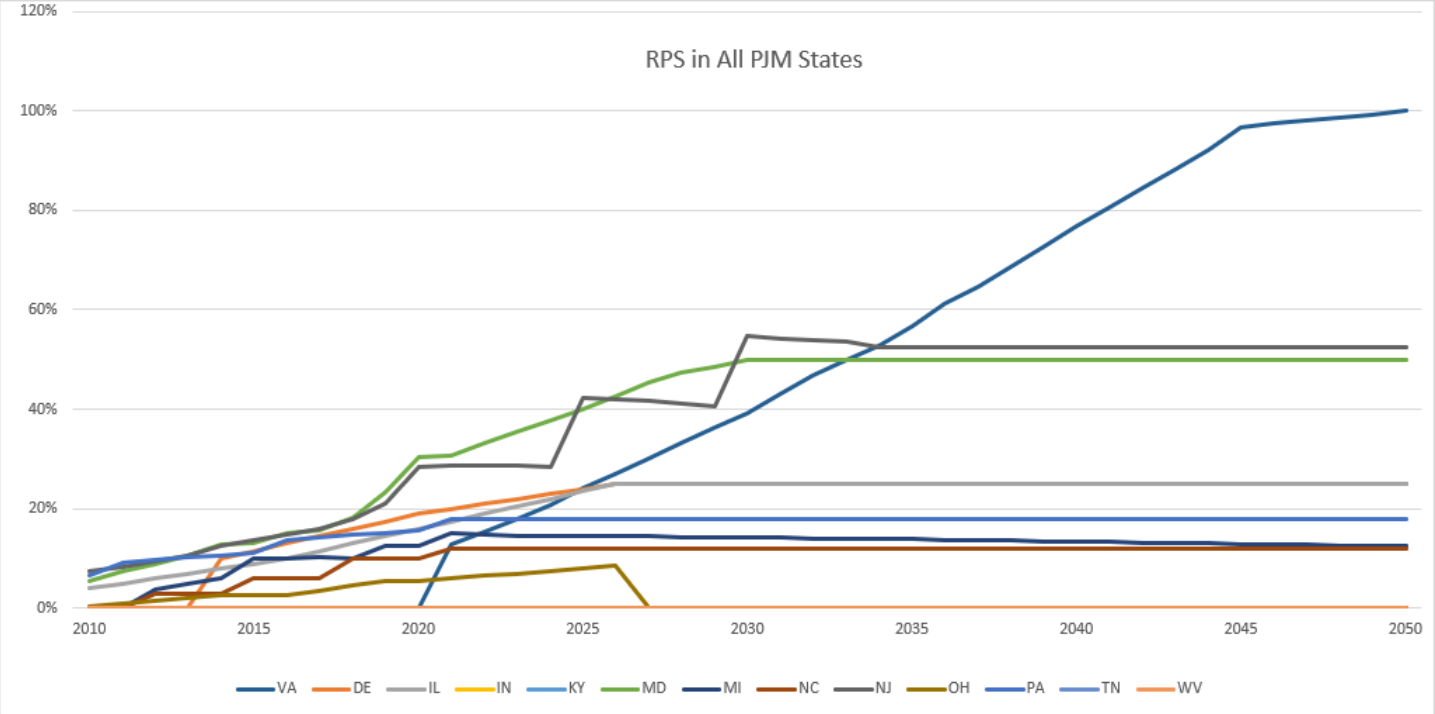
2020 LEGISLATION AND VCEA

In 2020, the General Assembly passed the Virginia Clean Economy Act (VCEA), which mandated a goal of 100% zero-carbon energy generation by 2050 and prescribed increasingly strict Renewable Portfolio Standards (RPS) for Virginia's investor-owned electric utilities. As discussed in more detail below, VCEA imposes a number of mandates that present challenges for the Commonwealth, including in:

- grid reliability;
- affordability;
- performance accountability;
- technology flexibility;
- land use and
- ability to contribute to the overall baseload capacity of PJM system;

As shown below, with VCEA's 30-year requirement instead of a series of intermediate objectives, Virginia is the first and only state completely within PJM to have adopted this form of carbon reduction commitment[13], and it is the only state among its competitor states with these inflexible implementation standards. Given the current technical, affordability and reliability challenges, these mandates require a periodic review and reauthorization.

Figure 6, Renewable Portfolio Standard Requirements Among PJM and Competitor States[14]



13 Lawrence Berkeley National Laboratory. February 2021. Some states, including NC, and IL have since adopted different RPS standards. In October 2021, NC passed House Bill 951, which charted a plan to reduce carbon emissions by 70% by 2030, and carbon neutrality by 2050. Illinois adopted a new 100% RPS requirement by 2045 on September 15, 2022, but only the greater Chicago area is served by PJM. Lee and Wise Counties and Norton City in Virginia are served by Kentucky utilities and are not within PJM.

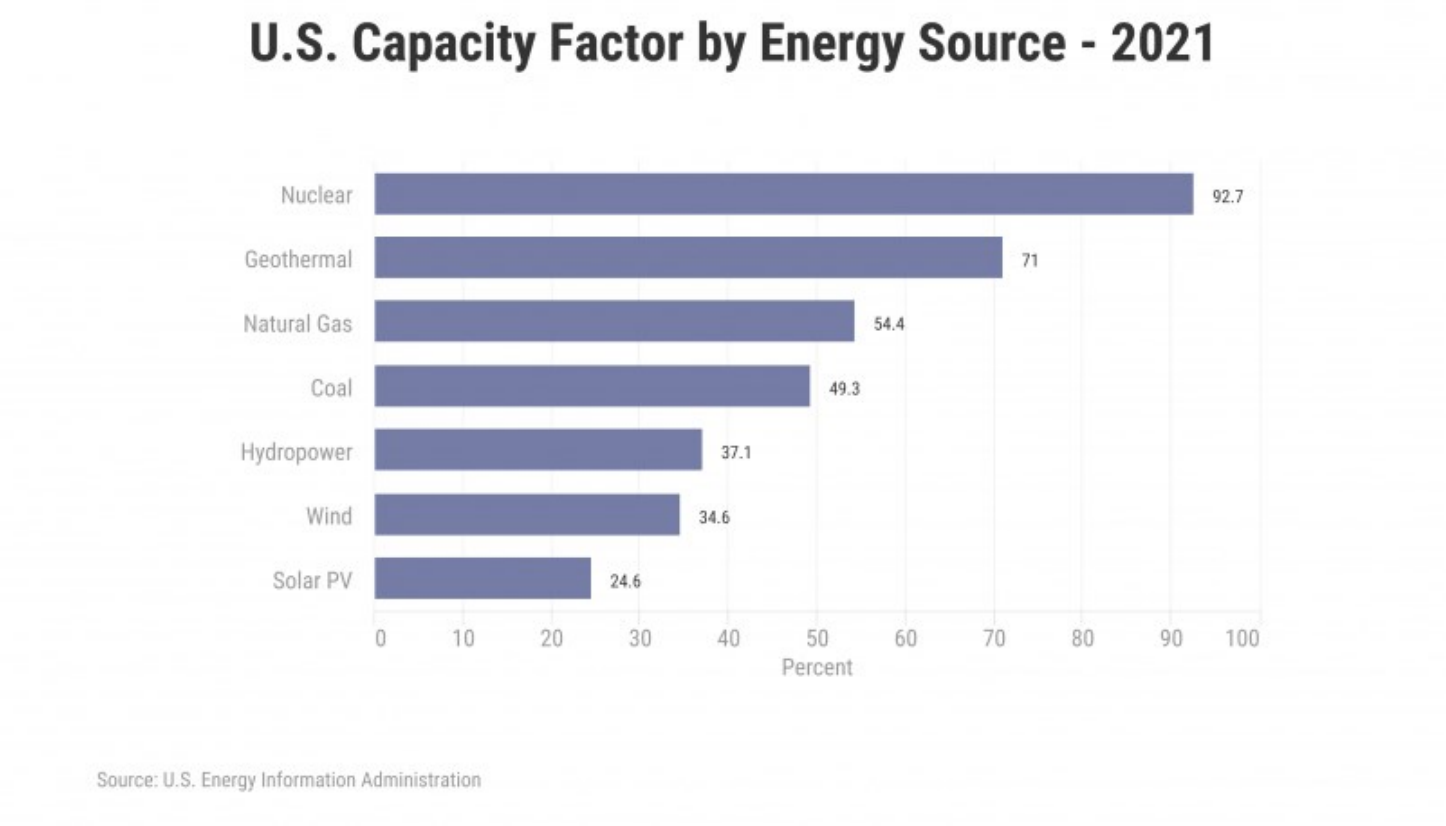
14 Lawrence Berkeley National Laboratory. February 2021.

Under the VCEA, Virginia is legally required to retire all baseload generation, except for incumbent nuclear power plants, in favor of intermittent renewable generation. With the retirement of baseload generation which is dispatchable and always on-demand, utility scale storage would be required at scale to manage power demand when the sun isn't shining and the wind isn't blowing. Such battery storage is not currently cost effective.[15] While cost burden could decline in the future, there should be thoughtful consideration of assumptions of incorporating utility scale storage into Virginia's generation stack prematurely.

As measured by Dominion and the SCC, full compliance with the VCEA will increase electricity costs over 2020 levels by 53% by 2030 and 72% by 2035.[16] This growth in energy costs will likely outpace competitor states that have more reasonable intermittent energy ambitions. In addition, these projected cost increases are front-loaded before the full transition to intermittent energy sources and retirement of natural gas generation facilities and assume the mostly unknown costs of utility-scale storage and associated transmission system upgrades.

In addition to substantially raising costs, retiring baseload generation in favor of solar and wind will reduce Virginia's electricity reliability. Capacity factors, or the percentage of time an energy generation system is producing energy as shown in *Figure 7*, vary widely across traditional and renewable sources. For example, nuclear is nearly three times more reliable than both wind and solar. As a result, the industrial world relies on continuous baseload generators such as natural gas, nuclear and coal. Cost, technical concerns related to utility scale storage and transmission upgrades demand prudence before decisions removing current baseload capacity are made final.

Figure 7. US Capacity Factor by Energy Source[17]



15 Lazard. Levelized Cost Of Energy, Levelized Cost Of Storage, and Levelized Cost Of Hydrogen. October 28, 2021.

16 Dominion Energy. 2021 Dominion Energy Integrated Resource Plan. Figure 2.5.1.

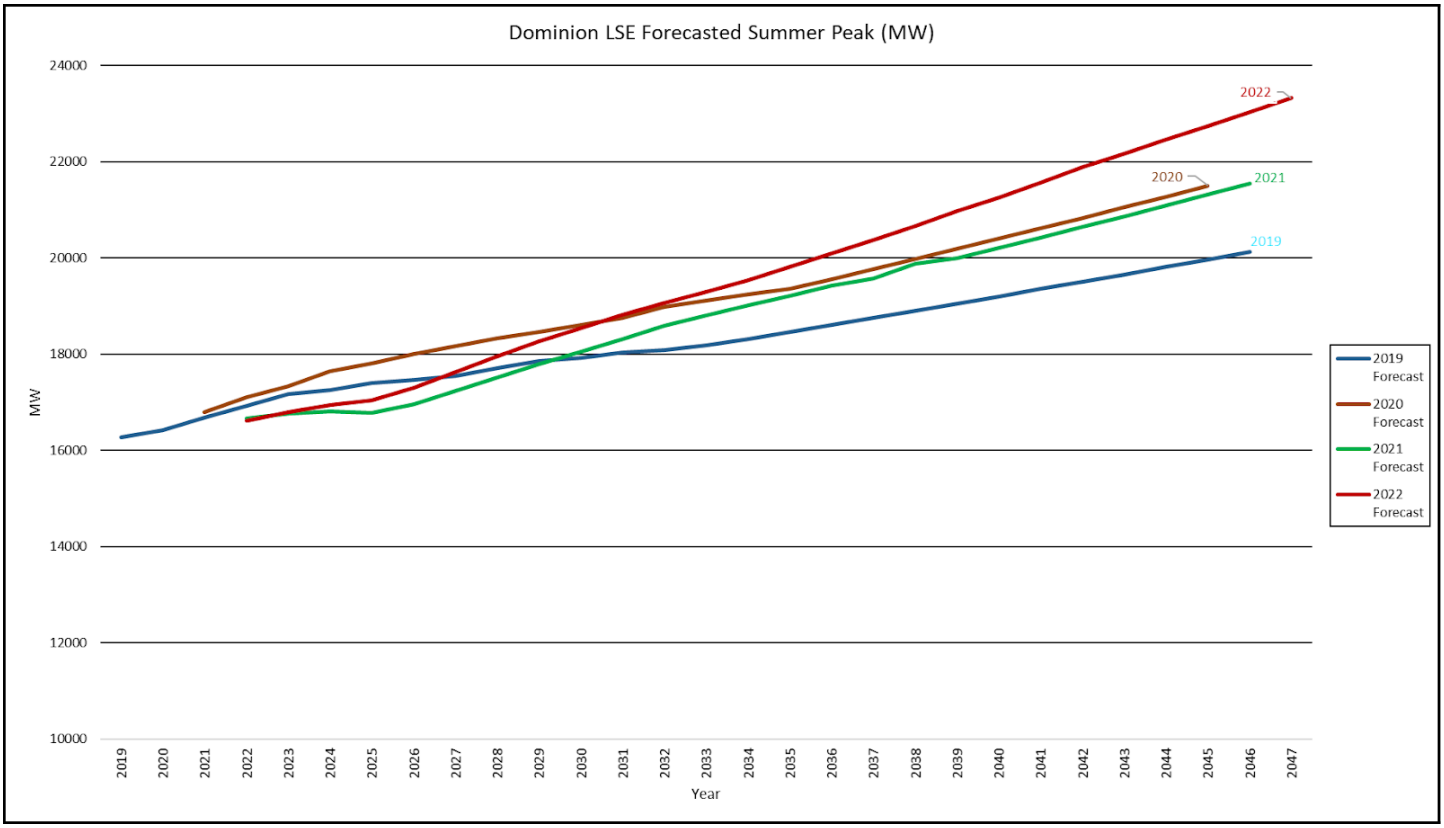
17 U.S. Department of Energy. Office of Nuclear Energy. "What is Generation Capacity?" May 1, 2020.

Every energy resource comes with tradeoffs. While the VCEA's ambitions for carbon reduction appear laudable, they come with substantial future risk. VCEA mandates are an inflexible, 30-year determination with a prescribed route that currently cannot be delivered and do not contain any guidelines ensuring reasonable energy costs for Virginian consumers. Blindly complying with the VCEA exposes Virginia families and businesses to outsized energy costs, risks the reliable delivery of energy and closes Virginia to innovative energy sources and technologies.

As Virginia focuses on job and business growth, Virginia's energy demand will increase. Our future needs will intensify demands on the grid as Virginians purchase electric cars, building owners increase electrification, and the Commonwealth continues to lead and expand in energy-intensive sectors like data center services and high-tech indoor farming agriculture.[18]

To illustrate the challenges of accurately forecasting rapidly changing energy demands, the chart below displays recent demand forecasts from Dominion Power. These forecasts show energy demand forecasts increasing as increased growth and electrification. The historical underestimation of power demand growth coupled with the required retirement of al traditional generation creates serious reliability and capacity concerns. Given the scale of Dominion' power capacity, the differences between demand forecasts represent huge variations in expected energy demand and risk of affordable and reliable supply across the Commonwealth.

Figure 8. Dominion Forecasted Peak Electricity Demand Over Time[19]



18 Weldon Cooper Center for Public Service. University of Virginia. "Electricity Sales Forecast for Virginia 2020-2050.

19 Various Dominion Energy IRPs.

Figure 9. Virginia Total Annual Energy Generation by Source and Future Portfolio Growth[20]

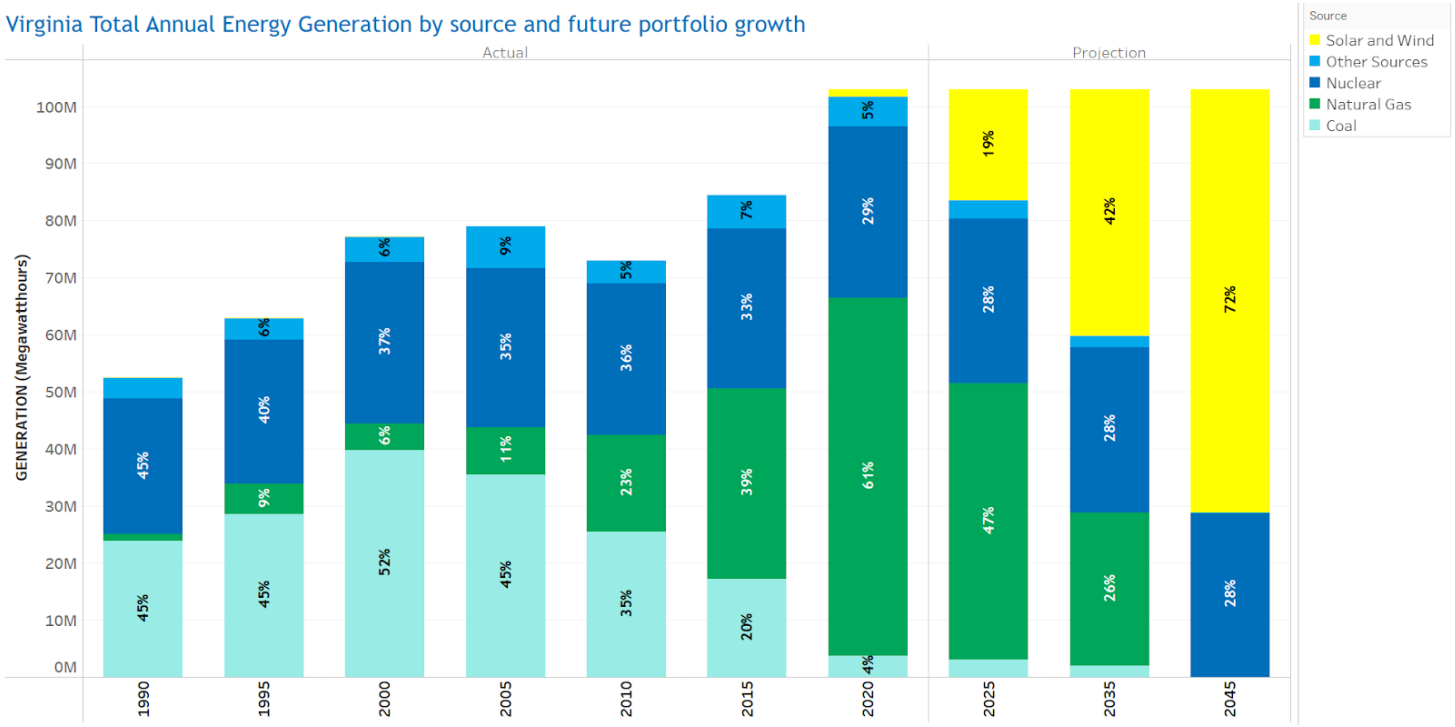
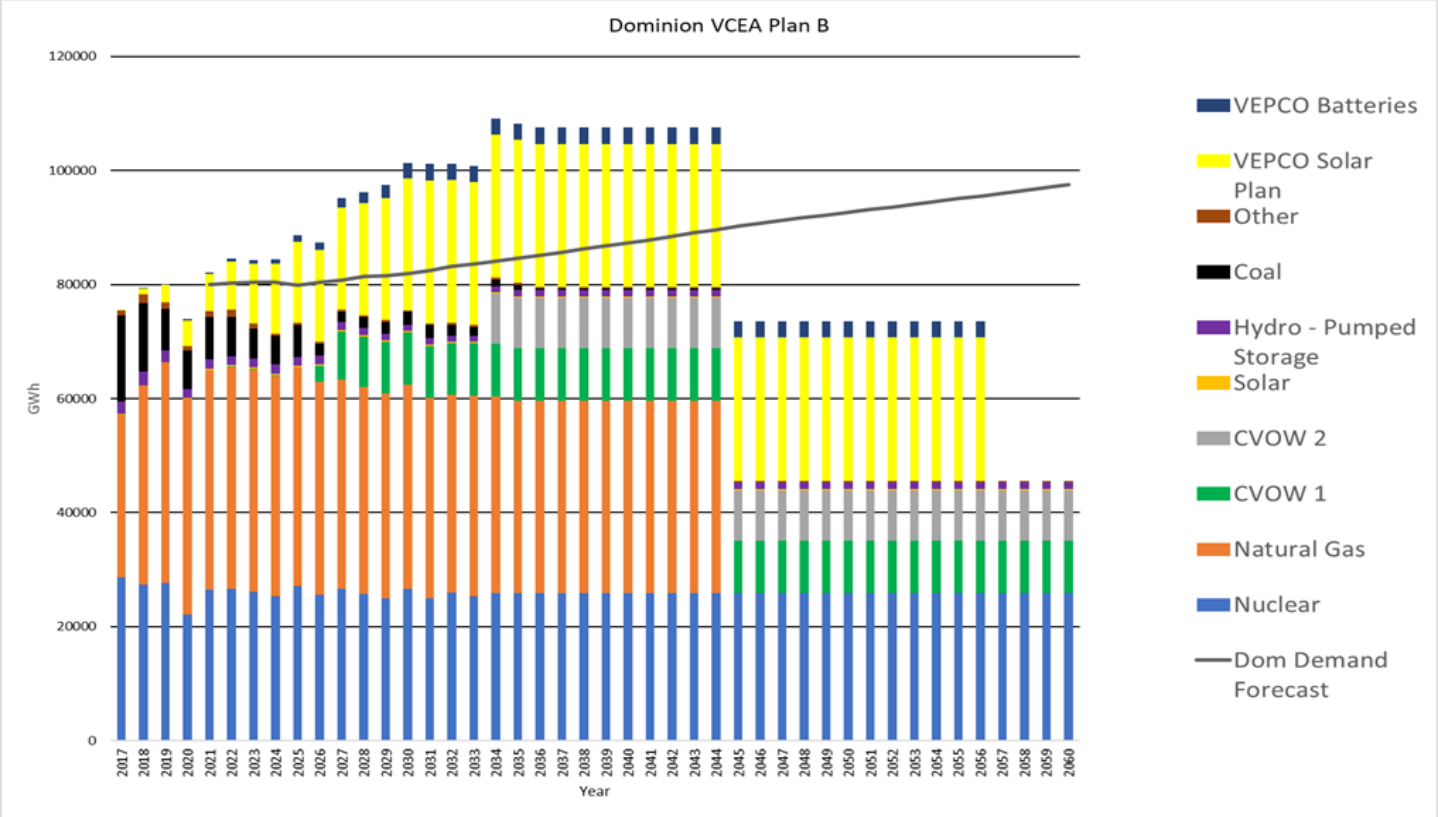


Figure 10. Dominion's Projected Customer Demand Compared to Generation Proile[21]



20 Energy Information Administration. Net Generation by State by Type of Producer by Energy Source.

21 Dominion Energy. 2021 Dominion Energy Integrated Resource Plan. Figure 2.5.1.Compiled using required VCEA integration of solar and offshore wind, retirements of carbon generation, capacity factors and values from Dominion's 2020 IRP. Demand forecast is extrapolated from 2047 until 2060 based on the CAGR for the forecast period. Other generation includes light fuel oil, heavy fuel oil, biomass, and conventional hydroelectric

To meet Virginians' round-the-clock energy needs, full compliance with the VCEA will necessitate, absent implementation of currently unavailable grid storage technologies or an expansion of nuclear and hydrogen technologies to replace the lost baseload generation, a reliance on other PJM states to produce the baseload generation capacity for the Commonwealth. In short, the success of VCEA depends on Virginia outsourcing reliable baseload capacity to other states, many of which have a high percentage of coal and natural gas generation and increasing Virginia's dependence on electricity imports. As a result, supply and transmission of energy to Virginia homes and businesses has the potential to become less reliable than today,

In addition, VCEA requires the retirement of reliable baseload generation and prescribes that Virginia will utilize only solar and wind generation (and legacy nuclear plants) beginning in 2045.[22] As the chart above highlights, this transition results in a significant supply shortage because VCEA results in a 58% reduction in baseload energy generation without planning for replacement sources.

Finally, VCEA's inflexible standards greatly reduce the opportunities for innovative energy generation technologies to emerge from the market and become incorporated into Virginia's energy portfolio. In short, the prescribed RPS standards were not subject to cost/benefit analysis, feasibility studies, or alternative analysis to evaluate what was in the best interests of Virginia. VCEA requires the perfect prediction of the unknowable future of clean energy three decades from now. The Commonwealth needs an energy plan that includes periodic reassessment and reauthorization to enable Virginia's energy economy to remain open and embrace innovation.

THE FRAMEWORK FOR VIRGINIA'S ENERGY FUTURE

The 2022 Virginia Energy Plan solicited input from over 200 diverse stakeholders and utilized an empirical data gathering process that included analysis produced by the Virginia Department of Energy and the Cadmus Group.

The Plan's goal is to ensure access to reliable, affordable, clean, and abundant energy so all Virginians can live, work, and raise a family in a growing and thriving Commonwealth. The Plan's "all of the above" energy generation approach is applied to a pragmatic set of principles:

1. Reliability
2. Affordability
3. Innovation
4. Competition
5. Environmental Stewardship

This Plan does not attempt to predict every technological innovation or long-term change in the production and consumption of energy. The Plan embraces flexibility and supports multiple technologies as a path to providing the appropriate balance of baseload and growing clean energy generation at a reasonable cost. The use of a framework and guiding principles, not prescriptive mandates, can drive consensus that unites all Virginians and sets the tone for a practical approach that will serve the Commonwealth into the future.

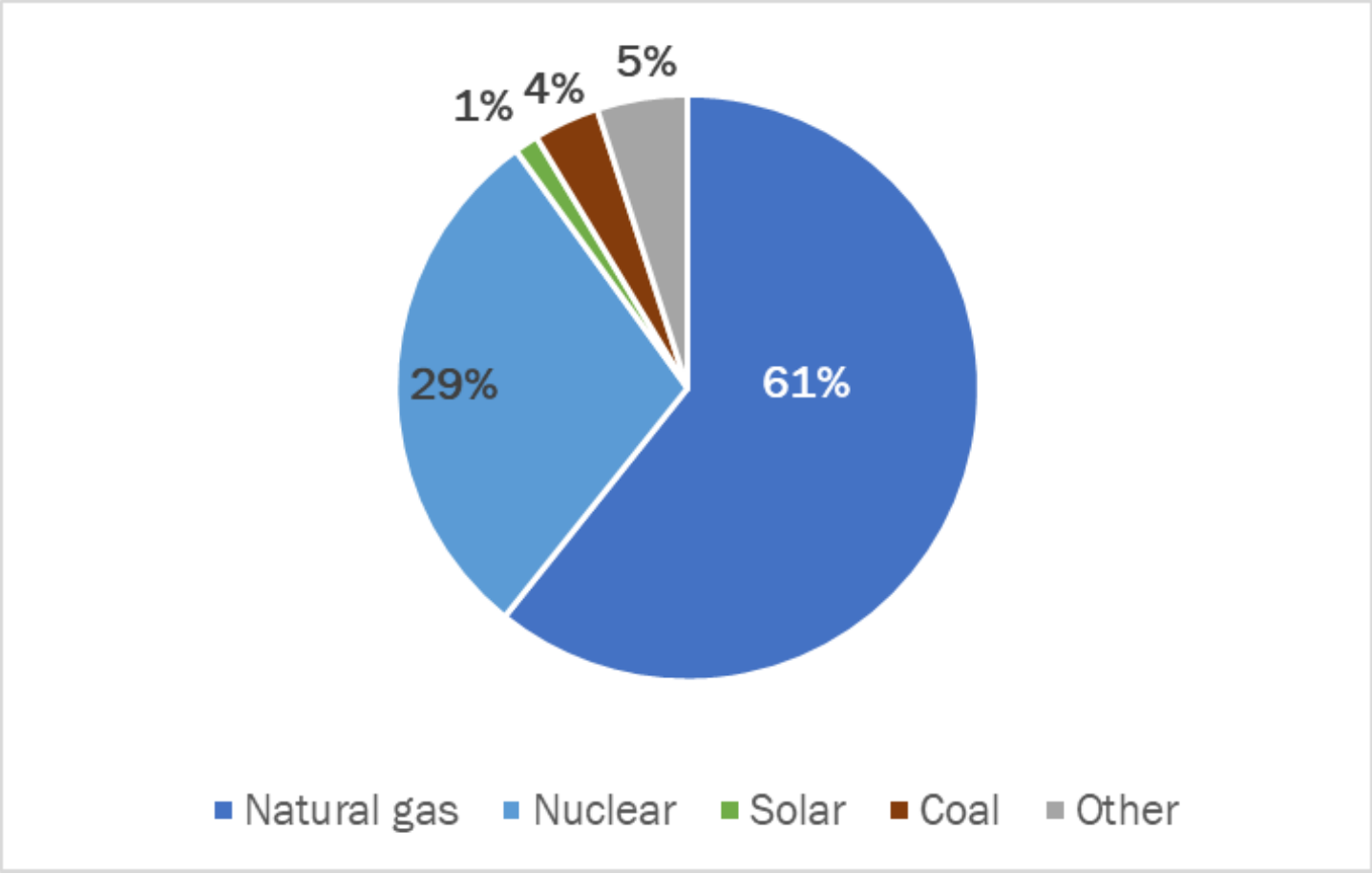
22 Dominion currently has a license for a third conventional nuclear reactor located at Lake Anna, but has halted construction

RELIABILITY

The lights must always turn on. From powering internet connections for students to heating homes in the winter, to critical data centers and state-of-the-art manufacturing facilities and to keeping a senior citizen warm in the winter, the reliability of our electricity grid is critical. As a seasonal state, Virginia experiences highly variable demand on its grid, with peak to trough swings that must be satisfied twenty-four-seven, 365 days a year. There are no holidays for power generation.

Reliability is predicated on sufficient baseload and the ability to meet peak demand with additional on-call or dispatchable generating power sources. Grid reliability is also impacted by the ecosystem of surrounding customers, utilities, the SCC and PJM. Today, the vast majority of this demand is met by continuous and dispatchable generation sources, primarily natural gas, nuclear, and to a much lesser extent coal. In addition, the Commonwealth relies on natural gas plants to meet increased energy needs during periods of peak demand, with total natural gas generation comprising 61% of Virginia's generation output in 2020.[23]

Figure 11. 2020 Generation Output by Fuel Source[24]



23 AND 24 Energy Information Administration. State Electricity Profiles.

Renewable energy sources, such as solar and wind, provide electricity on a low cost, but intermittent basis. The output from these sources varies across seasons, weather systems and time of day, rendering them challenging to meet consistent energy demands – as experienced in recent years in California and Western Europe.

VCEA requires the Commonwealth to retire its natural gas power plants by 2045 (Dominion) and 2050 (Appalachian Power). These facilities currently comprise 67% of the current baseload generation as well as 100% of the power plants that meet peak demand. This switch has not occurred successfully anywhere in the world.

During the foreseeable future, intermittent energy generation cannot meet all of our energy needs. Some of this capability could theoretically come from battery storage, but the reliability, cost, safety, and availability of raw materials to incorporate this technology at scale is at odds with the timeline constraints of the current VCEA requirements.

At this point in time, while solar and wind generation by itself is affordable, battery storage systems are extremely expensive and cost prohibitive. For example, current battery storage costs per MWh are more than four times more expensive than the cost of a MWh produced by a solar generator on a levelized basis.[25, 26]

While investment in battery innovations is an economic development opportunity that can produce meaningful breakthroughs in the future, a prudent energy plan should not force the retirement of economically viable baseload generation. Until battery and grid modernization technologies mature and are deployed for intermittent energy generation at affordable costs, the Commonwealth should not consider these sources as viable substitutes for current baseload technologies.

VCEA has also ignored the reliability aspects of other clean energy generation technologies, such as nuclear (SMR) and hydrogen, as well as carbon capture, utilization and storage (CCUS) advancements. This Plan advocates for exploratory investments to capitalize on the long term opportunities of these technologies, with particular focus on reliability associated with our top recommendation to invest in the development of the first commercial SMR facility in the U.S. in Southwest Virginia.

Whether it is nuclear, hydrogen, natural gas, or renewables paired with battery storage, having reliable baseload generation capacity is critical to meeting future energy needs. Forecasted power has increased meaningfully, and all forecasts show Virginia's power needs increasing consistently on an annual basis. This rate of increase will become more pronounced as the Commonwealth's population grows, the economy expands, more Virginians choose to buy electric vehicles, and more business and jobs come to Virginia, especially in energy intensive industries such as data centers.[27,28] To meet this consistently growing demand while continuing the transition to clean energy, retaining existing and exploring new baseload generation is key.

Similar to RPS requirements, the California Air Resources Board regulations, which are currently official policy in Virginia, banning the sale of non-electric vehicles by 2035 will put significant strains on Virginia's grid. The Weldon Cooper Center at UVA estimates that, if Virginia maintains its Zero Emission Vehicle standard, electricity demand will increase by 5,000 GWh annually leading up to 2035, amounting to a total demand increase of 25,000 to 32,000 GWh.[29] Transitioning away from baseload generation while also attempting to accommodate this increase in electricity demand, which should be market-driven instead of mandated, could be disastrous for Virginia's grid reliability California, which is now asking drivers to refrain from charging their electric vehicles to prevent blackouts, provides an instructive example of what banning non-electric vehicle sales and retiring all baseload generation would look like in Virginia.

25 Energy Information Administration. Levelized Costs of New Generation Resources in the Annual Energy Outlook 2022. March 2022.

26 Lazard. Levelized Cost Of Energy, Levelized Cost Of Storage, and Levelized Cost Of Hydrogen. October 28, 2021.

27 Virginia has received $100 million to install electric vehicle infrastructure and charging stations across the Commonwealth

28 Our current forecasts do not consider Virginia adopting California's Air Resources Board regulations. Current mandates will require the rate of electrification to increase markedly if Virginia does not reassert its own electric vehicle policymaking.

29 Weldon Cooper Center for Public Service. University of Virginia. "Electricity Sales Forecast for Virginia: 2020-2050."

Figure 12. Energy Generation Under VCEA[30]

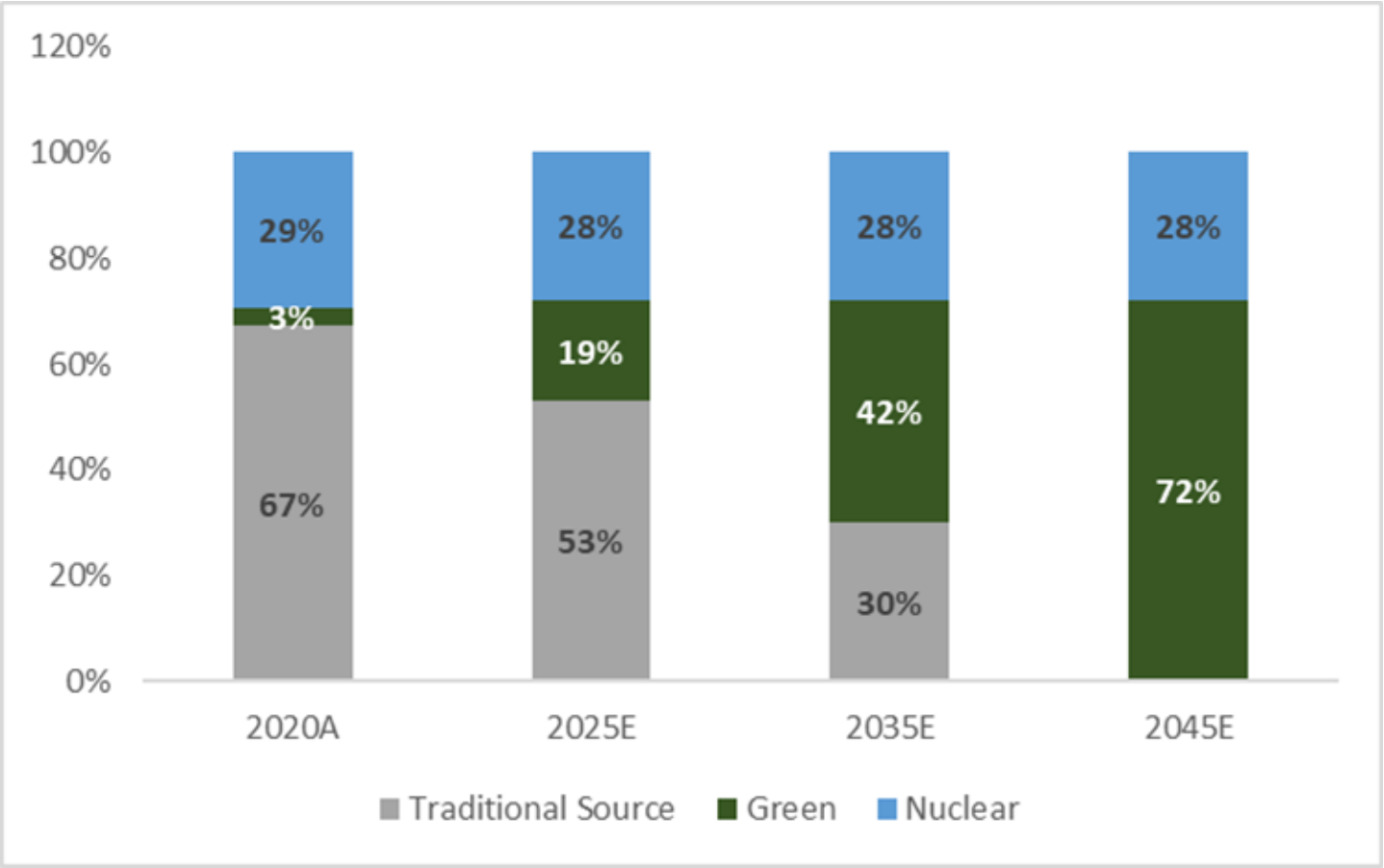
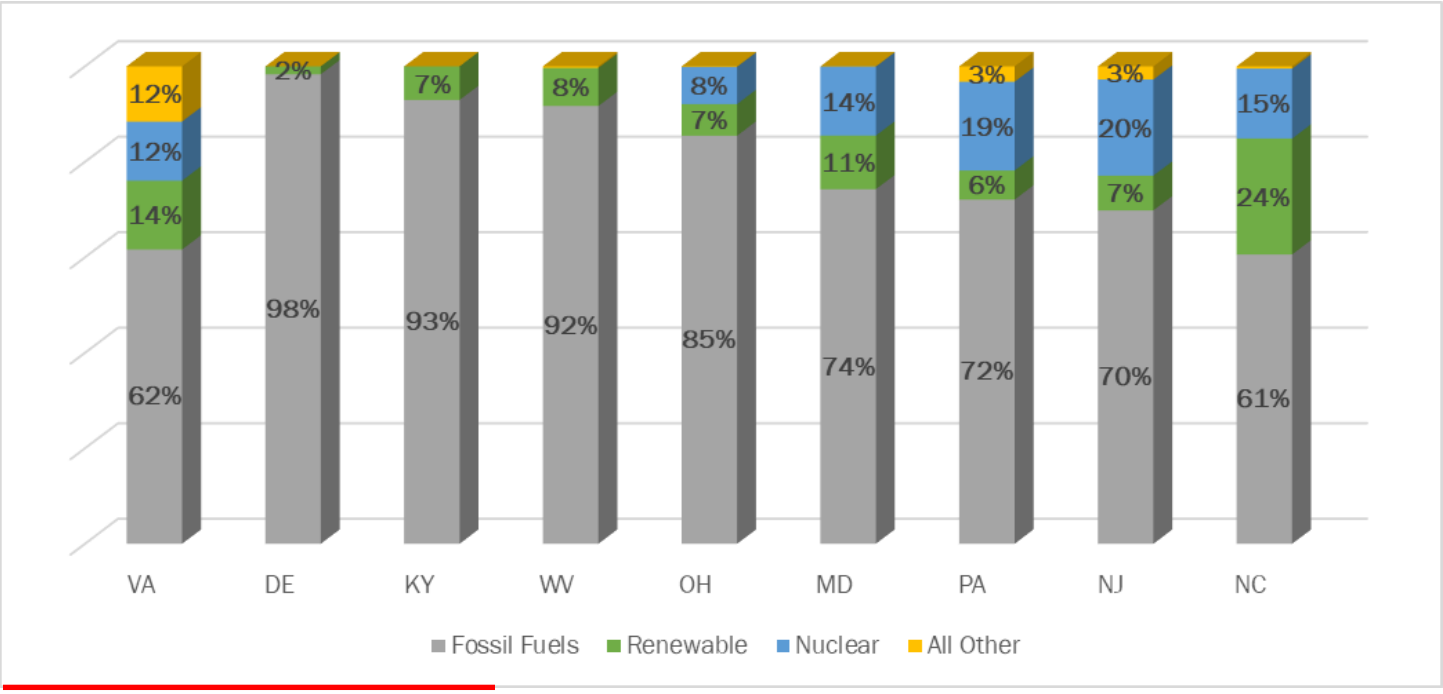


Figure 13. Net Summer Capacity (MW) of Utility Scale Units by Technology[31]

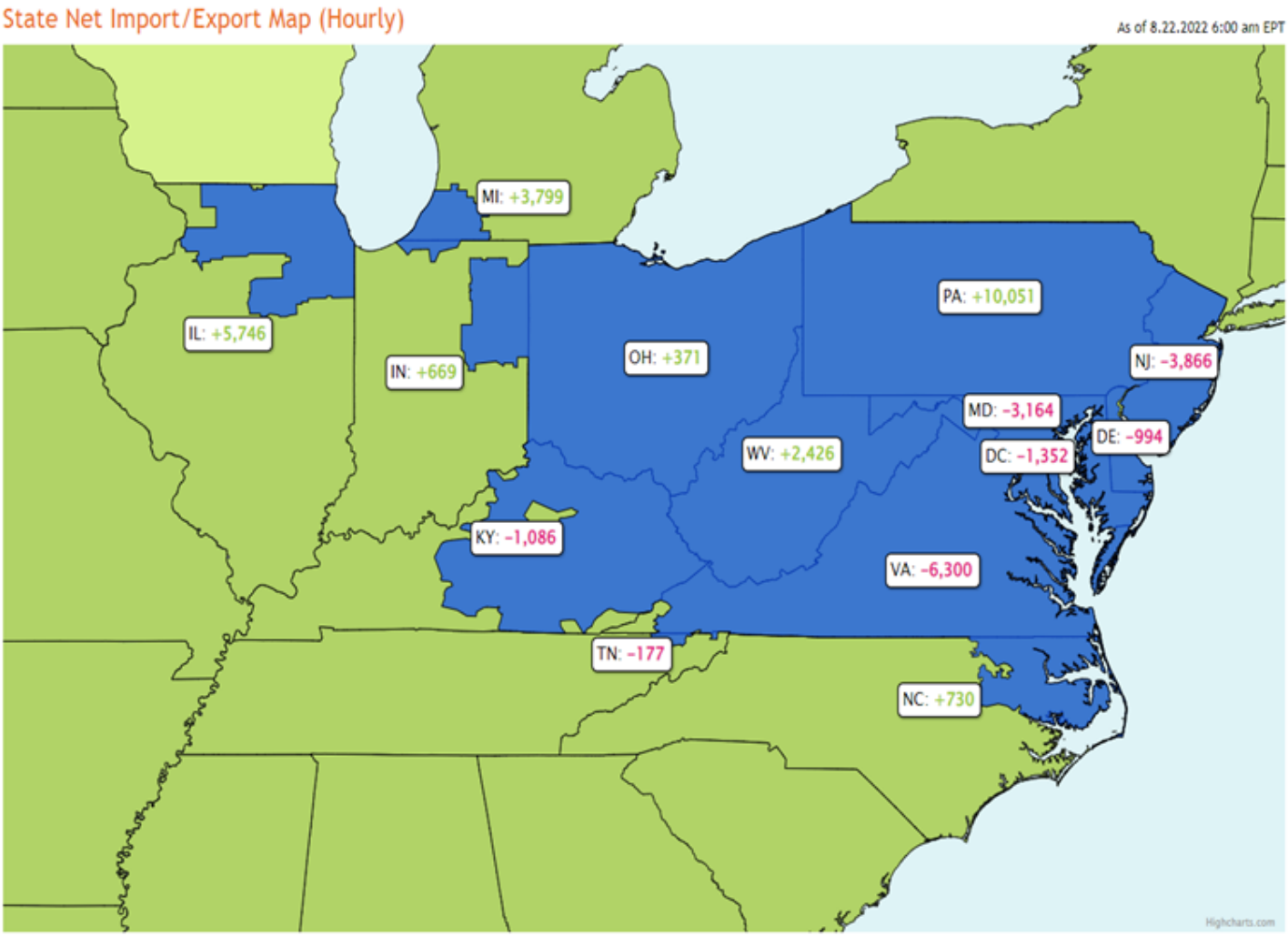


30Energy Information Administration. Net Generation by State by Type of Producer by Energy Source.Note that Dominion and Appalachian Power are required to retire all natural gas generation by 2045 and 2050, respectively.

31 https://www.eia.gov/electricity/data/state/

With the mandates in VCEA to reduce current baseload production in Virginia, the Commonwealth will have to rely on electricity imports from other states that are generated by coal, gas, and nuclear sources within PJM's transmission network, as shown above, to satisfy demand. Note that capacity is distinct from actual power generation as shown in *Figures 12 and 13*. Renewable energy represents a much larger percentage of Virginia's current installed capacity in comparison with other PJM states. At the same time, intermittent generation only produced 4% of the power in Virginia despite comprising 14% of Virginia's installed capacity. If Virginia increases its reliance on intermittent generation, the level of electricity imports from other states will increase and expose Virginia to changes occurring in net exporting states, such as Pennsylvania and West Virginia.

Figure 14. Sample PJM State Import/Export Map (Hourly)[32]



PJM's forecasting drives transmission infrastructure planning, investment approval, and implementation timing. These forecasts have occurred once a year historically, and they are an important resource for regulators in their approval processes. However, additional energy demand often requires several years to implement the necessary capacity and transmission upgrades. As energy demand changes with increasing rapidity in certain sectors and localities, an elevated risk of generation and transmission constraints can occur.

This risk is exacerbated by implementation challenges in slow, unpredictable permitting processes and local zoning restrictions that have the potential to delay or block necessary new projects. These bottlenecks can impact ratepayers and limit economic development opportunities.

32 PJM. "State Net Import/Export Map (Hourly)."

The permitting process in conjunction with litigious special interest groups has also significantly impacted the ability of natural gas utilities to meet the energy demands of their customers. Most of the natural gas supplied to consumers in Virginia comes from the Gulf Coast and from the Appalachian region by interstate natural gas pipelines, such as Transco (Williams) and the Columbia system (TC Energy). According to the U.S. Chamber of Commerce Global Energy Institute, natural gas opponents have caused the cancellation or delay of three interstate natural gas pipelines in recent years, including Virginia's Atlantic Coast Pipeline (ACP), which was cancelled, and Mountain Valley Pipeline (MVP), which was delayed, ultimately preventing $7.8 billion in GDP, resulting in over 50,000 jobs and $1.83 billion in lost tax revenues.[33]

MVP is an interesting case study. The project will provide up to two million dekatherms per day of natural gas transmission capacity to markets in the Mid- and South Atlantic, and will include economic development sites in Southwest Virginia. Since the project was first proposed in 2014, it has been subject to numerous legal actions and protests organized by groups such as the Natural Resources Defense Council, the Sierra Club and Appalachian Voices. However, despite these roadblocks, the project is currently 94% complete and just received a deadline extension from the Federal Energy Regulatory Commission (FERC) to become functional by 2026.[34] Natural gas serves many end market needs in addition to power generation, including manufacturing processes, heating and low-emission transportation.

Virginia has historically been supportive of natural gas pipeline projects due to their clear benefits of job creation, economic development and energy reliability. Recently, the Commonwealth has issued statements to FERC in support of the completion of MVP and the Virginia Reliability Project (VRP), which would replace two existing segments of the Columbia Gas transmission pipeline system. VRP will help enhance reliability and energy efficiency along the Columbia Gas system and reduce natural gas shortages that are harming economic development in Hampton Roads.[35]

Finally, with the rapid structural changes taking place in the power sector, including increasing cyberattack vulnerabilities, introduction of variable energy resources and severe weather events, ensuring reliable, secure and resilient energy is vital and starts with energy security planning. The Virginia Energy Security Plan is part of the Commonwealth of Virginia Emergency Operations Plan and includes identification of methods to strengthen the physical and cyber security of Virginia's energy infrastructure and mitigate the risk of energy supply disruptions. Virginia must also take actions to ensure the grid is properly maintained and robust.

33 Interstate Natural Gas Association of America. Pipeline Permitting.

34 Utility Dive. "FERC gives NextEra, ConEd, Equitrans 4 more years to finish $6.6B Mountain Valley gas pipeline."

35 TC Energy. Virginia Reliability Project.

The 2022 Virginia Energy Plan includes several recommendations to preserve Virginia's grid reliability and ensure Virginia users have access to energy when and where they need it.

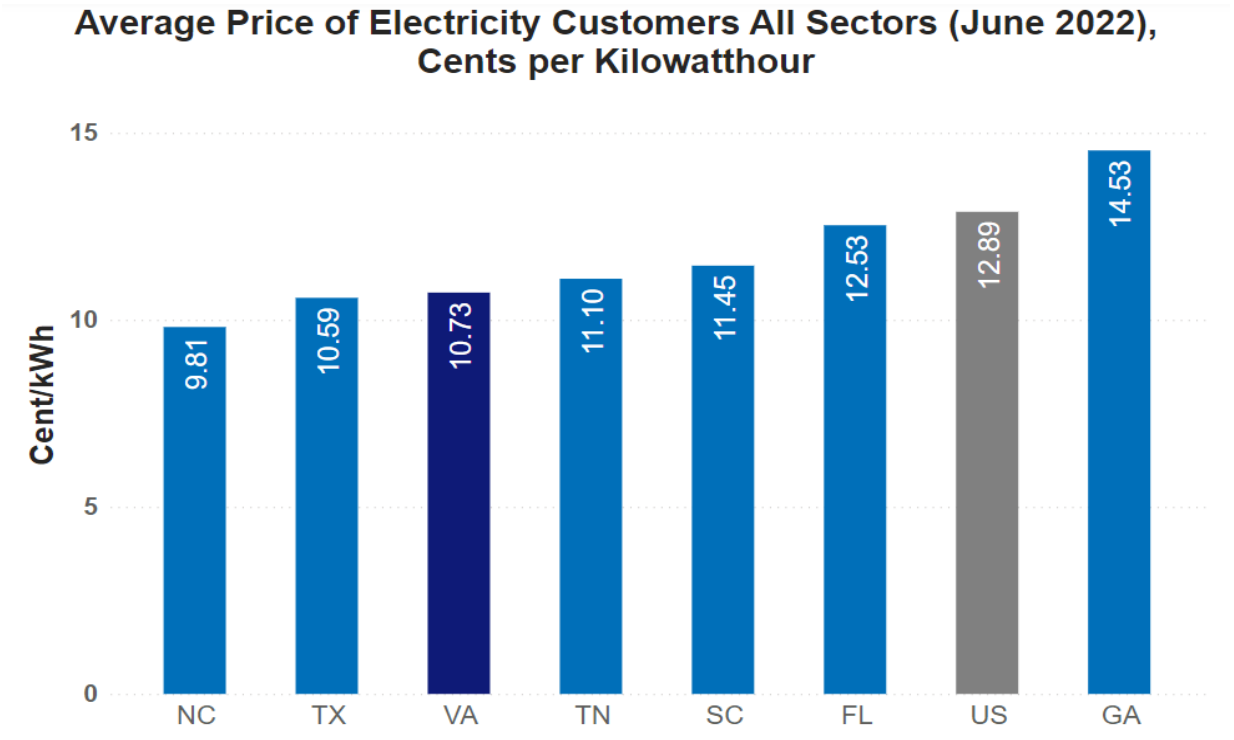
- Require the Virginia Clean Economy Act to be reevaluated based on latest technology availability and cost assessments and reauthorized in 2023, and every five years thereafter
- Restore discretion to the SCC concerning power plant retirement timelines, including proactive authority to defer RPS requirements to ensure reliability, and require periodic reports to be produced to the Governor and General Assembly on the impact of potential retirements on reliability.
- Repeal the legislative mandate tying Virginia to California's electric vehicle mandate to protect grid reliability.
- Direct the Department of Environmental Quality and the Virginia Department of Transportation to expedite approval of critical infrastructure projects.
- Require the Virginia Department of Energy and the Virginia Economic Development Partnership to study methods to facilitate improved forecasting in collaboration with PJM, utilities and industry stakeholders to improve infrastructure planning for future energy needs.

AFFORDABILITY

The Commonwealth's energy rates were competitive historically, but costs have increased rapidly over the last decade. Legislative changes to the energy framework over the last fifteen years have removed some of the regulatory controls previously in place to safeguard consumers.

Today, across energy customer types, Virginia is the 15th most affordable state in the country. While Virginia has enjoyed reasonable energy prices among competitor states, costs are increasing, ultimately making Virginia less competitive.

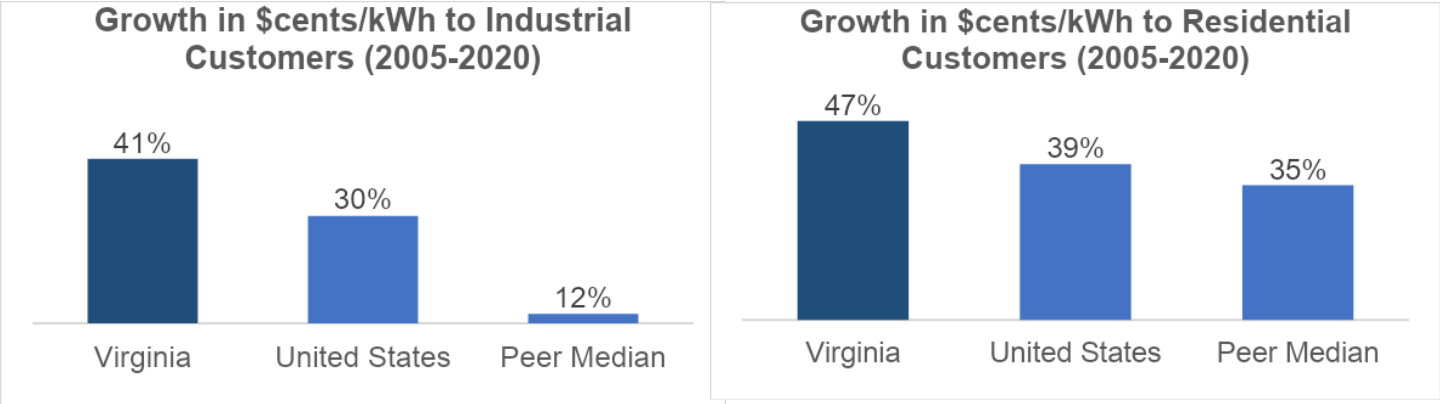
Figure 15. Average Price of Electricity to Customers All Sectors (June 2022)[36]



36 Energy Information Administration. Electricity Data. Monthly Energy Review. August 2022.

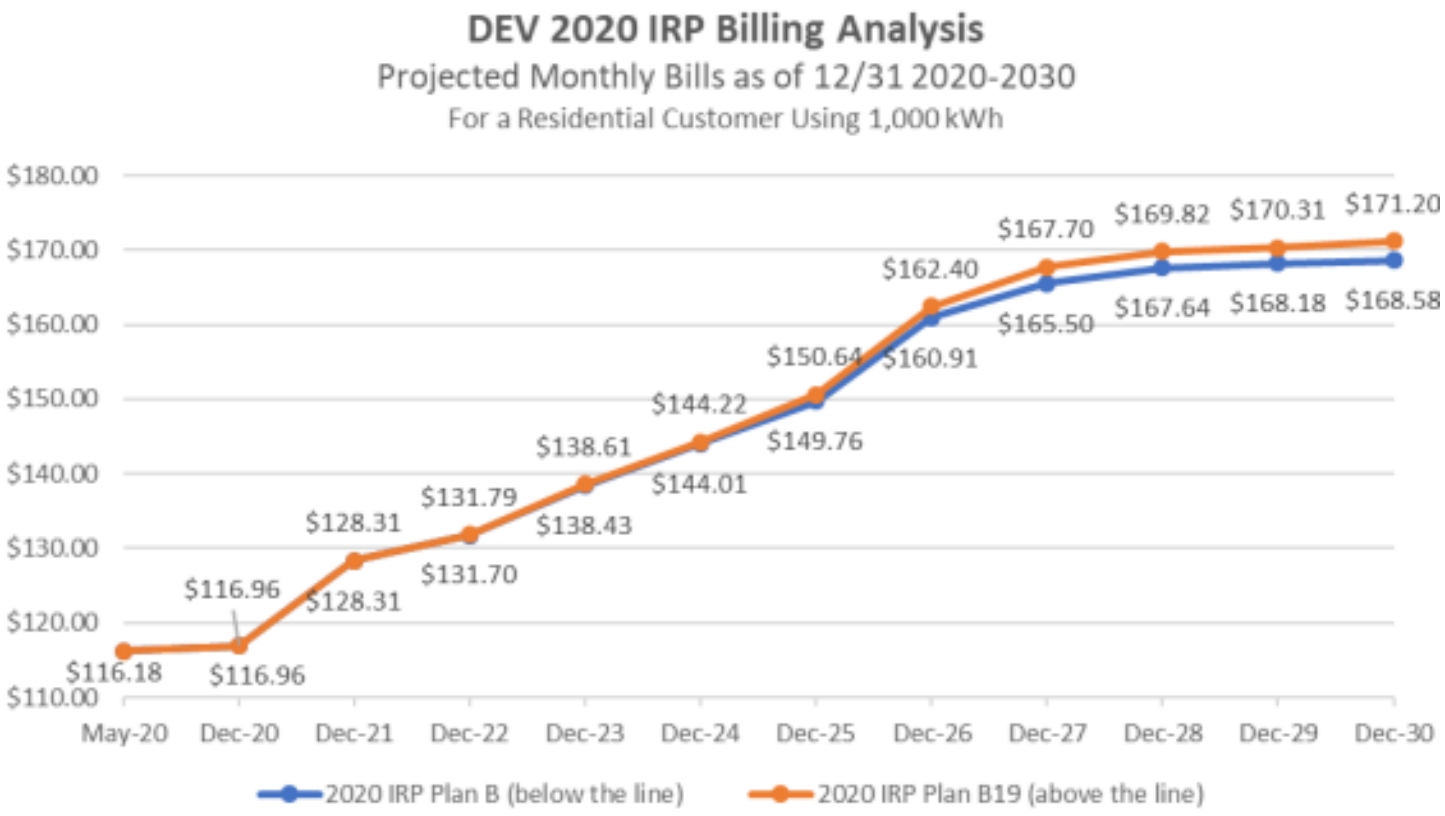
From 2005 to 2020, rates for Virginia residential customers have increased by 47%, compared to 39% nationwide and 35% compared to competitor states.

Figure 16. Growth in Average Price of Electricity (2005-2020)[37]



On August 29, 2022, the SCC released their annual report on implementation of the Virginia Electric Utility Regulation Act, as required by statute. This concluded VCEA is projected to increase energy bills for Virginia ratepayers over $40 per month (almost $500 annually) with an expected rate increase of almost 6% annually over the next five years. The report concluded that electricity prices have risen and will rise substantially in Virginia.

Figure 17. Dominion's Integrated Resource Plan Billing Analysis (2020)[38]



37 Energy Information Administration. Electricity Data. Monthly Energy Review. August 2022.

38 SCC. "Implementation of the Virginia Electric Utility Regulation Act Pursuant to § 56-596 B of the Code of Virginia." September 1, 2021.

As mentioned previously, RACs are the primary driver of energy bill increases. With the costs of RACs for average residential customers increasing from $0.00 a month when they were first authorized in 2007 to over $30 a month in 2021, the number of RACs have grown significantly and now encompass 24 separate charges. RACs benefit utilities because, compared to base rates, projects recovered through RACs include guaranteed rates of return regardless of project performance. Despite their prominence on bills, several RACs are often bundled within one line item and billing explanations included in customer bills offer no explanation of what services RAC charges are going toward.

Figure 18. RACs Paid by an Average Dominion Residential Customer [39]

DEV ELECTRIC ULTILITY BILLS AS OF JULY 1, 2022					
RECOVERY MECHANISM	DESCRIPTION	CURRENT RESIDENTIAL BILL	PROPOSED INCREASE IF PENDING	PROPOSED BILL	REQUESTED EFFECTIVE DATE
BASE RATES	BASE	$ 70.63	$ -	$ 70.63	-
FUEL FACTOR	FUEL	$ 35.38	$ -	$ 35.38	7/1/22*
RIDER T1	TRANSMISSION	$ 6.90	$ (3.69)	$ 3.21	9/1/22
RIDER R	BEAR GARDEN GAS CC	$ 1.14	$ -	$ 1.14	-
RIDER W	WARREN GAS CC	$ 2.34	$ (0.38)	$ 1.96	4/1/23
RIDER BW	BRUNSWICK GAS CC	$ 2.10	$ 0.70	$ 2.80	9/1/22
RIDER GV	GREENSVILLE GAS CC	$ 2.75	$ -	$ 2.75	-
RIDER S	VCHEC	$ 3.70	$ -	$ 3.70	-
RIDER B	BIOMASS	$ 0.30	$ 0.33	$ 0.63	4/1/23
RIDER US -2	SOLAR	$ 0.17	$ 0.05	$ 0.22	9/1/22
RIDER US -3	SOLAR	$ 0.96	$ -	$ 0.96	-
RIDER US-4	SOLAR	$ 0.30	$ -	$ 0.30	-
RIDER CE	SOLAR	$ 1.32	$ 1.13	$ 2.45	-
RIDER SNA	NUCLEAR RELICENSING	$ -	$ 2.11	$ 2.11	9/1/22
RIDER RPS	RGGI	$ 0.18	$ 1.64	$ 1.82	9/1/22
RIDER RGGI	RGGI	$ -	$ -	$ -	7/1/22**
RIDER OSW	OFFSHORE WIND	$ -	$ 1.45	$ 1.45	9/1/22
RIDER PPA	RENEWABLE PPAs	$ -	$ (0.08)	$ (0.07)	9/1/22
RIDER C1A/C2A/etc.	ENERGY EFFICIENCY	$ 1.31	$ 0.29	$ 1.60	9/1/22
RIDER U	STRATEGIC UNDERGROUNDING	$ 2.50	$ (0.51)	$ 1.99	4/1/23
RIDER GT	GRID TRANSFORMATION	$ 1.16	$ -	$ 1.16	-
RIDER E	COAL ASH	$ 1.25	$ 0.70	$ 1.95	9/1/22
RIDER CCR	COAL ASH	$ 2.95	$ 0.01	$ 2.96	12/1/22
RIDER RBB	RURAL BROADBAND	$ 0.03	$ 0.14	$ 0.17	12/1/22
RIDER USF***	PIPP	$ 0.03	$ -	$ 0.03	-
RIDER VCR****	VOLUNTARY CREDIT RIDER	$ (0.47)	$ -	$ (0.47)	
TOTAL		$ 1.36.93	$ 3.90	$ 140.83	

The SCC is designed to protect ratepayers from excessive energy costs and exercises regulatory authority over Virginia's utility monopolies, including the electric cooperatives. These entities must petition the SCC for permission to build new assets and recover costs on their operations and capital expenditures. In determining whether these petitions should be approved, the SCC determines whether these requests would have any material effect on reliability of existing service, are required by public convenience and necessity and are contrary to the public interest. Determinations of requests for cost recovery are "reasonable and prudent" if they represent a cost-effective approach to providing ratepayers with a reliable energy supply.

39 State Corporation Commission. Status Report: Implementation of the Virginia Electric Utility Regulation Act Pursuant to § 56-596 B of the Code of Virginia. September 1, 2022.

The General Assembly has increasingly diluted the SCC's authority by passing legislative "public interest" and "reasonable and prudent" declarations for certain projects and mandating Certificate of Public Convenience and Necessity (CPCN) approval for specific facilities to no longer require such a finding from the SCC. These interventions, including those in the Grid Transformation and Security Act (GTSA) and VCEA, have resulted in projects bypassing the SCC's methodology. At the same time, the SCC is mandated to approve them and associated cost recovery because of statutory requirements.

In addition to the SCC, the Office of the Attorney General's Consumer Counsel Section is also an authority designed to protect ratepayers. The Consumer Counsel Section is often a party to rate cases before the SCC and offers testimony in support of fair rates for utility customers. Attorneys with the Consumer Counsel Section have significant technical expertise that make them a valuable asset for ratepayer protection.

Another method to protect ratepayers from excessive costs is the rate of return utilities are allowed to earn as determined by the SCC and based on statutory parameters. For example, under the SCC's most recent review of Dominion's earnings, the utility is allowed to earn a 9.35% rate of return.[40] If, during triennial base rate reviews, the SCC finds a utility earned a rate of return above this allowable rate, the utility is required to return the overearnings to customers as refunds or rate reductions. However, the General Assembly has periodically passed legislation, such as the GTSA, that allows utilities to keep overearnings that would have ordinarily been returned to ratepayers if utilities spend them on particular projects. Consequently, in recent rate review periods, potential refunds to customers have been significantly reduced as a result.

The 2022 Virginia Energy Plan includes several recommendations to keep costs under control and protect Virginians from rising energy prices.

- Grant proactive authority to the SCC, through legislation, to defer RPS requirements, providing flexibility for substitute technologies and to reflect least-cost resource planning
- Restore biennial rate reviews for Virginia's Phase One and Phase Two utilities
- Restore full discretion to the SCC, by reducing or eliminating the use of legislative "public interest" and "prudent and reasonable" mandates
- Expand resources for the Attorney General's Consumer Counsel Section and establish an office within the Virginia Department of Energy to share analysis and engage more in the SCC rate case process
- Establish a workgroup to determine how the structure of RACs can be improved to protect ratepayers and increase billing transparency
- Introduce legislation to require the SCC to conduct comparative cost analysis regarding alternative generation sources versus proposed renewable projects as part of utilities' project applications
- Direct the Virginia Department of Energy to study reforms regarding cost overruns on major utility projects, including utilities' ability to earn a rate of return on such overruns
- Direct the Virginia Department of Energy to review utility rates of return with those received by comparable independent power producers, including assessing the definition of peer states
- Direct the Virginia Department of Energy to study the allowable overearnings buffer for utility rates of return and allowable overearnings as a result of Grid Transformation and Security Act investments

40 SCC. "SCC Approves Settlement in Financial Review of Dominion Energy Virginia Rates; Customers to Receive Refunds Totaling $330 Million and Rate Reduction of $50 Million."

INNOVATION

From hydroelectricity to nuclear energy, the Commonwealth has been home to some of the nation's greatest energy innovations.

Coal mining in the United States began in Virginia over three hundred years ago in Chesterfield County. The Bath County Pumped Hydroelectric Storage Facility is the largest energy storage facility in the world. In 1957, the nation's first commercial nuclear generator went online at Fort Belvoir. Today, the Commonwealth is a welcome home to nuclear energy and its innovations, and two nuclear power stations – the Surry and North Anna Power Stations – produce roughly 95% of the Commonwealth's reliable, clean electricity.

This Plan anticipates innovation and opportunities for lower cost, more reliable and environmentally conscious energy generation technologies to evolve and emerge and advocates for investment in new technologies in addition to solar and wind. This Plan favors an "all of the above" power generation system, and Virginia will need more clean energy technologies that can also support baseload generation.

NUCLEAR

Virginia is home to two of the world's largest nuclear companies, BWXT and Framatone, located in Lynchburg. Huntington Ingalls at the Norfolk Naval Base has the responsibility for upgrades and maintenance on the 49 submarines and aircraft carriers powered by nuclear energy. The Virginia Nuclear Energy Consortium coordinates resources and programs, across 82 institutions in the Commonwealth, that participate in the advancement of the nuclear industry in Virginia and the nation.

Virginia is a clear leader in human capital for nuclear technology in the United States with two of thirty nuclear engineering programs in the United States at Virginia Commonwealth University and Virginia Tech. Six universities in Virginia offer degrees in nuclear engineering and advanced physics, thousands of transitioning service members from the U.S. Navy join Virginia's workforce every year, Virginia Community Colleges include career paths that support the nuclear workforce, and the Virginia Energy Workforce Consortium trains the next generation of energy specialists. The Commonwealth should take advantage of this incredibly competitive position on the forefront of nuclear energy research and development to become the nation's leader in SMR technology. Accordingly, this Plan advocates for the development of the first commercial SMR in the U.S. in Southwest Virginia. This plan also calls for developing spent nuclear fuel recycling that offers the promise of a zero-carbon emission energy system with minimal waste and a more closed-loop supply chain.

HYDROGEN

This Plan will promote the active introduction of groundbreaking new hydrogen generator technology. Hydrogen is a once-in-a-lifetime opportunity to reimagine Virginia's future due to its potential to meet many energy needs through an abundant, dispatchable and zero-emission fuel source where water is the only required input. Hydrogen advocates including Connected DMV are currently working to move the Commonwealth forward and advance the zero-emission hydrogen industry.

Promoting innovation in these technologies and making Virginia the hub to invent, test, create and deploy nuclear and hydrogen energy installations is an opportunity to develop the Commonwealth's existing competitive advantages and create new high-paying jobs in research and development, high-tech construction and maintenance and manufacturing.

RENEWABLE ENERGY

The Coastal Virginia Offshore Wind (CVOW) project, the largest offshore wind project of its kind, is planned for completion in February 2027 and will cost $9.8 billion. CVOW will consist of 176 wind turbines with a nameplate capacity of 2.6 gigawatts and will produce power at a 42% capacity factor to power up to 660,000 homes. Offshore wind also offers Virginia a chance to seize a global competitive advantage in emerging supply chains and technologies. In particular, Virginia should become the market leader in offshore wind technology, development and deployment.

While power generation varies directly with wind fluctuations, wind generation offers significant benefits as one of the least resource intensive energy generation options once construction is complete. Unlike traditional generation, wind generation does not require fuel to generate power. As a coastal state with significant offshore resources, Virginia can benefit from increased wind generation.

But, similar to all emerging technologies, new offshore wind projects need guardrails to protect ratepayers. The Plan strongly supports projects that can be built on-time, on budget and deliver power at projected levels.

Solar also offers an opportunity for Virginia to become a leader. On a levelized basis, solar energy is among the cheapest forms of energy available. The solar supply chain is increasingly being onshored into the U.S., and Virginia's existing renewable energy industry in conjunction with our port, highway and rail infrastructure can be a landing ground for the new domestic solar manufacturing industry. Virginia is also home to several solar industry companies who are leading research and development activities to fully integrate solar into Virginia's energy mix.

BATTERY TECHNOLOGY SUPPLY CHAINS

Virginia can lead with new opportunities to access critical mineral resources and bring battery supply chains into the Commonwealth. With an energy innovation plan that encourages multiple clean energy sources and increased choice, Virginia can also improve its economic development opportunities in attracting businesses to the Commonwealth. Many businesses desire to lower their environmental footprint through access to clean energy sources, and Virginia's energy system should deliver on that request without additional cost or reliability tradeoffs to residential customers.

CARBON CAPTURE, UTILIZATION AND STORAGE

To reduce the impact of carbon emissions today, carbon capture, utilization and storage (CCUS) technologies offer a chance for Virginia to lower its emissions and foster innovative new technologies. CCUS is a process that captures carbon dioxide emissions from sources like coal-fired power plants and either reuses or stores it so it will not enter the atmosphere. Storage options include oil and gas reservoirs, unmineable coal seams and saline reservoirs, all of which exist in Virginia. CCUS has been only partially developed, because capture and sequestration is very expensive. However, when combined with a meaningful use, CO2 can be converted into plastics, alcohols for use as biofuels, concrete and reactants for chemical synthesis. With the right technological development, CCUS can become less cost prohibitive and an effective way for Virginia to lower its carbon emissions.

COAL COMBUSTION RESIDUALS AND WASTE COAL UTILIZATION

Virginia is currently considering methods to resolve the problems associated with coal ash and waste coal disposal piles. Coal ash includes several pollutants such as mercury, cadmium, and arsenic that can contaminate waterways, ground water, drinking water and air. In Virginia, the Department of Environmental Quality (DEQ) manages coal ash landfills and has begun a process to begin closing several of these. The EPA also has several regulations that govern the disposal of coal ash, but coal ash can also be recycled to create economic benefits. Companies, such as the SEFA Group, have developed processes to change the chemical nature of coal ash so that it can be used to create concrete. HB 657 and SB 120 from the General Assembly's 2022 Session direct DEQ and the Department of Energy to evaluate and recommend methods to clean up coal ash and waste coal sites, including potential utilization methods that offer a chance to innovate coal disposal in Virginia.

RESEARCH & DEVELOPMENT

Finally, Southwest Virginia's Energy DELTA (Discovery, Education, Learning and Technology Accelerator) Lab initiative is currently transforming Virginia's energy communities through a collaborative effort by the Virginia Department of Energy, the Southwest Virginia Energy Research and Development Authority and its business development partner InvestSWVA. The Energy DELTA Lab utilizes an economic development strategy to drive growth and diversify Southwest Virginia's economy. The work that goes into DELTA Lab projects will bring new opportunities to a region that has been significantly impacted by the downturn of fossil fuel production.

The 2022 Virginia Energy Plan includes several recommendations to encompass new technologies and bring the Commonwealth to the forefront of energy innovation.

- Work with government, industry, and academic partners to develop a plan to deploy a commercial small modular nuclear reactor in Southwest Virginia.
- Collaborate with the Virginia Nuclear Energy Consortium and higher education institutions to establish a nuclear hub in Virginia
- Create a new focus within VEDP that targets businesses developing and implementing emerging energy generation technologies
- Develop a hydrogen roadmap with state, local, and private sector stakeholders to poise Virginia to capitalize on hydrogen generation opportunities
- Leverage federal funds and state funds to support energy innovation in multiple areas such as: (1) biogas; (2) carbon capture and storage; (3) critical minerals; (4) hydrogen; (5) grid modernization/resilience; and (6) spent fuel recycling.
- Study the creation of incentives to encourage energy infrastructure development for business-ready sites

COMPETITION

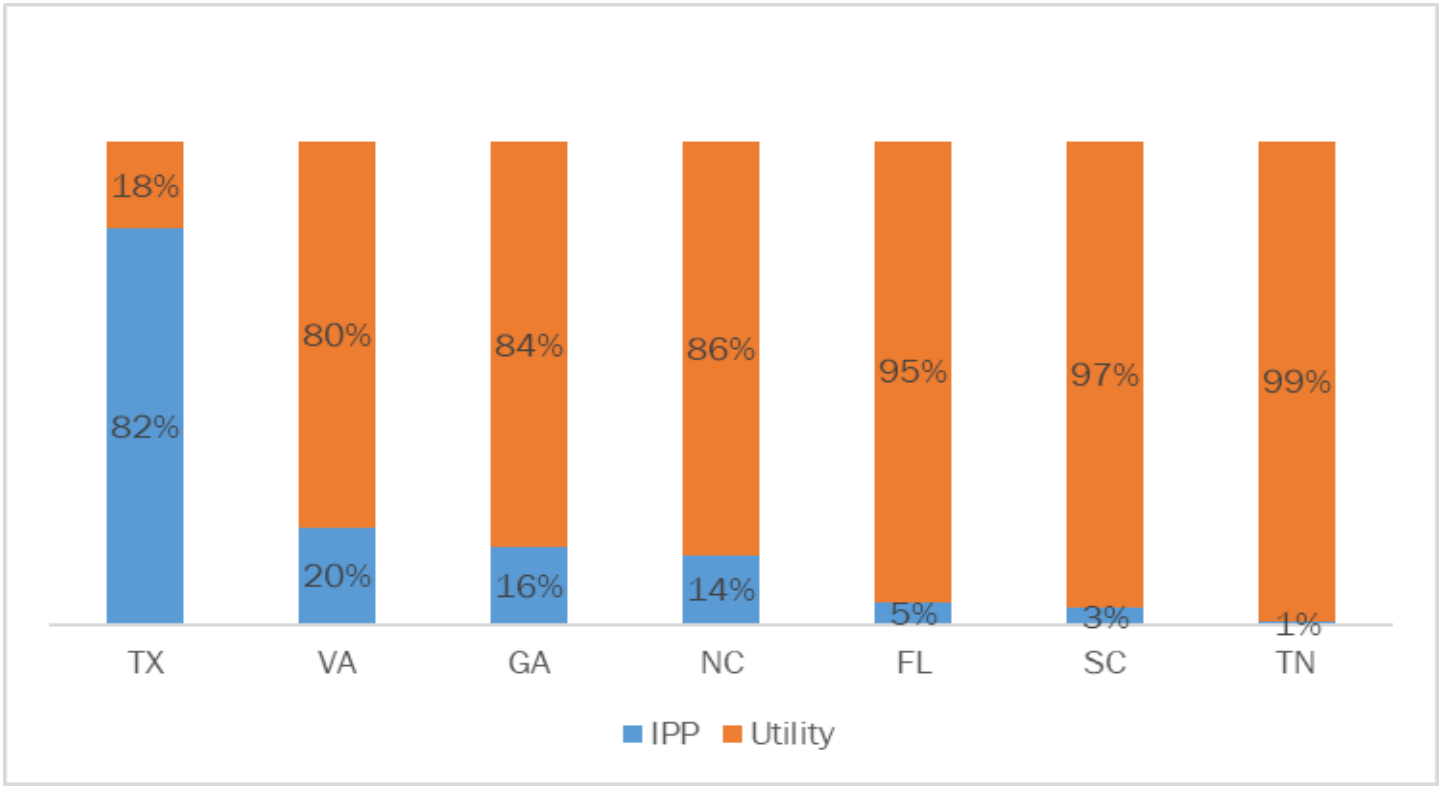
Virginia's energy consumers receive power through investor-owned utilities granted monopoly territories and regulated by the SCC, which determines if a utility's investment plans (new facilities, upgrades, etc.) are in the public interest and if the costs associated with the investment are reasonable and prudent. These determinations are critical to protect ratepayers, because utility customers bear the risk of asset performance.

In this regulated system, ratepayers should be protected from excessive capital expenditure risk while also guaranteed "always on" electricity service to businesses and residential customers, including low-income and rural Virginians. In return, utilities are inoculated from competition and provided a fair rate of return on all investments assessed as reasonable and prudent. Utilities are also guaranteed cost recovery from asset retirements and unanticipated events which require additional expenditures.

The Code of Virginia currently contains very limited provisions permitting certain customers to purchase their electricity on a competitive basis, and these provisions include significant barriers to customers who wish to exercise energy choice.

In addition to utilities, independent power producers (IPPs) generate electricity and sell their power to the PJM wholesale market. Virginia utilities then purchase this power to help meet the energy demands of their own customers. Ordinarily, when power is generated by a utility, the rates they charge include cost recovery plus a guaranteed rate of return. Purchased power, as opposed to utility-generated power, can keep electricity rates lower when the price of purchased power is lower than a utility's costs plus the utility's prescribed rate of return.

Figure 19. Production Split – Utilities vs. Independent Power Producers Across Competitor States (2020)[41]



41 Energy Information Administration. State Electricity Profiles.

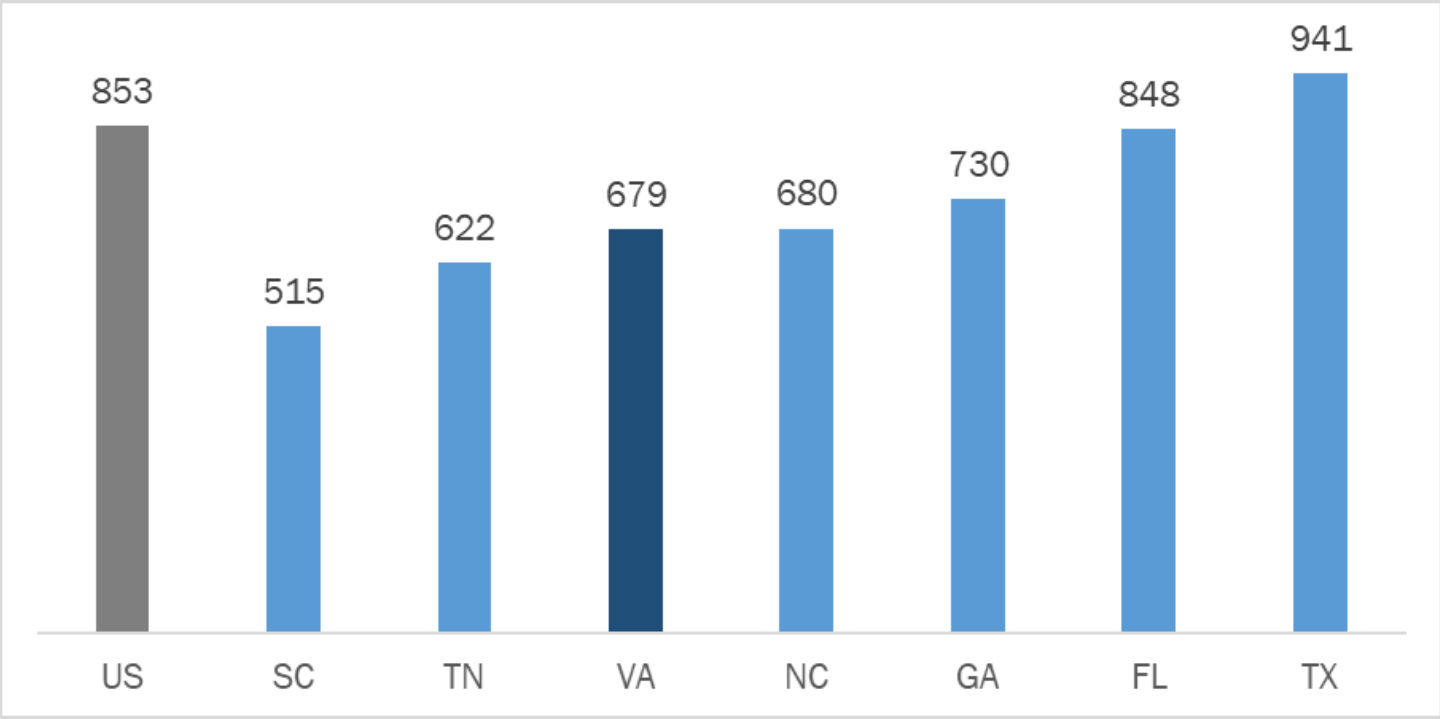
There are several important benefits to Virginia's regulated monopoly model, but current policy unnecessarily restricts certain projects from competition in the energy market. Both businesses and residential customers enthusiastic about installing their own solar and wind generation units and purchasing electricity from competitive service providers are overly burdened by regulations that prevent them from exercising energy choice. By exploring ways to offer customers more choice within the regulated electricity market, Virginia may be able to lower consumer rates and attract businesses that wish to directly match generation with their energy portfolio preferences.

The 2022 Virginia Energy Plan includes several recommendations to offer electricity customers more choice in where they source their energy.

- Convene a workgroup to recommend a plan to increase the opportunity for 100% renewable competitive service providers to participate in the marketplace and open Virginia's energy markets to independent power producers while maintaining Virginia's existing utility model.
- Convene a workgroup to recommend plans to remove barriers to industrial and commercial customers being able to aggregate energy loads and purchase power from a competitive service provider
- Remove barriers to distributed generation, including shared solar, and increase the ability of Virginians to install power resources on their property.
- Open select projects to competitive bids by independent power producers, including new solar and offshore wind projects.

ENVIRONMENTAL STEWARDSHIP

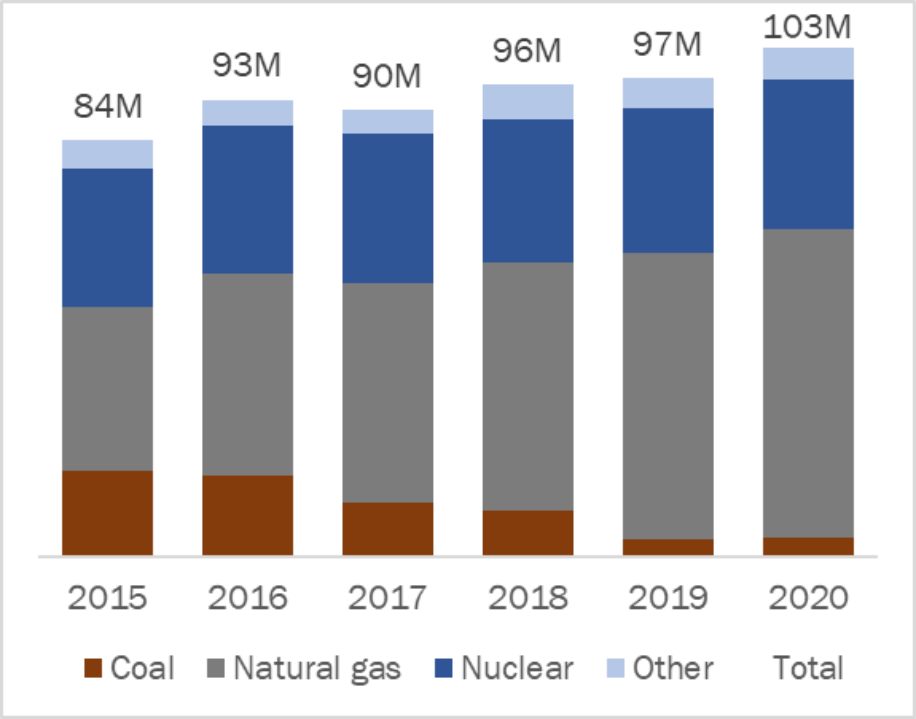
Figure 20. Carbon Dioxide Emission Rates (lbs/MWh) Across Competitor States (2020)[42]



42 Energy Information Administration. State Electricity Profiles.

Through the transition to natural gas turbines with higher efficiency and the retirement of coal plants, the Commonwealth has been able to satisfy baseload and peak demand while realizing significant carbon emission reductions.

Figure 21. Virginia Generation by Energy Source[43]



This shift from coal to low-emission natural gas generation and the trend of emissions reductions in the Commonwealth have occurred prior to Virginia joining RGGI in 2020. Because of the ability in Virginia for utilities to directly pass through the costs to consumers, any "incentive" through RGGI to reduce emissions—as well as costs—does not allow for RGGI to work as a means to incentivize a power generation shift in a way to produce meaningful reductions in emissions. In short, in Virginia RGGI is simply a tax on ratepayers that does not alter the behavior of electrical utilities and subjects Virginians to the influence of other states within RGGI – a bad deal for Virginia when the Commonwealth is already seeing significant emissions reductions.

Figure 22. Primary Energy Sources and Carbon Dioxide Emissions Rates of Competitor States[44]

GEOGRAPHY	PRIMARY ENERGY SOURCE	CO2 EMISSIONS RATE (lbs/MWh)
US	NATURAL GAS	853
SC	NUCLEAR	515
TN	NUCLEAR	622
VA	NATURAL GAS	679
NC	NUCLEAR	680
GA	NATURAL GAS	730
FL	NATURAL GAS	848
TX	NATURAL GAS	941

43 and 44 Energy Information Administration. State Electricity Profiles.

Environmental stewardship cannot only be limited to atmospheric emissions. Negative environmental impacts are also occurring on certain renewable energy developments. VCEA requirements for significant amounts of solar developments has encouraged deforestation, loss of agricultural land and increased runoff of pollutants and sediment into our watersheds. While renewable energy sources have attractive emission characteristics, wind and solar generation are among the most demanding from a land use perspective. Conventional solar installations require between 12 and 19 times as much land per MWh than natural gas, and between 40 and 60 times as much land per MWh than nuclear.

With VCEA mandates, solar capacity will need to increase to 16,100 MW, which will require the development of roughly 161,000 acres of available land[45]. This land requirement to comply with the VCEA represents a total footprint approximately four times the size of the District of Columbia.

For all power generation technologies, Virginia does not have any regulations to govern the end-of-life, decommissioning and disposal processes of energy installations. As disposal needs increase with the development and use of new and existing energy sources, Virginia must ensure we have measures in place that will protect our environment from the disposal of all energy technologies.

The 2022 Virginia Energy Plan includes several recommendations to protect Virginia's natural resources and improve the Commonwealth's environmental quality.

- Require through legislation that the SCC consider end-of-life planning for energy developments.
- Invest in developing renewable energy recycling technologies
- Encourage the reduction of methane emissions from active and abandoned coal mines and encourage methane and biogas capture on public assets
- Promote energy efficiency by studying smart grid and demand response programs

CONCLUSION

The 2022 Virginia Energy Plan charts a path forward for Virginia that moves responsibly toward incorporating renewable energy technologies while keeping energy rates affordable, guaranteeing reliable energy delivery, making Virginia's energy economy more competitive, opening the door to innovative technologies and incorporating necessary environmental stewardship.

The Virginia Energy Plan will be a living document that lays the foundation for common sense energy policy, ensuring that the Commonwealth remains the best place to live, work and raise a family.