

THE COMMONWEALTH OF VIRGINIA'S

2022 ENERGY PLAN



RELIABLE. AFFORDABLE. CLEAN. INNOVATIVE.

VIRGINIA DEPARTMENT OF ENERGY





COMMONWEALTH of VIRGINIA
Office of the Governor

Glenn Youngkin
Governor

October 3, 2022

To My Fellow Virginians,

I'm proud to present, on behalf of the Virginia Department of Energy and our entire Administration, the Commonwealth of Virginia's 2022 Energy Plan.

To ensure that Virginia is the best place to live, work and raise a family, Virginia must *grow*. We need to grow new jobs. We need to grow new businesses. We need to grow our population. And, to fuel that growth, we need a sensible, achievable, energy plan that provides abundant, reliable, affordable and clean energy.

We need to keep families warm in the winter and safe from the summer heat. We need to keep the kitchen humming at the family-owned restaurant getting ready for the dinner rush. We need to keep the lights on, the internet powered, communication flowing, and we need to do it without driving further runaway inflation.

As we look to build on our dominance in energy-intensive industries like data centers and advanced computing and increase our leadership in emerging fields like advanced manufacturing, ag-tech, and biopharmaceuticals, we know that our grid must deliver power, 24 hours a day, 7 days a week, 365 days a year, and it must deliver that power at a competitive price.

The plan adopted in recent years by the previous administration goes too far in establishing rigid and inflexible rules for the transition in energy generation in Virginia. We need to recognize that a clean energy future does not have to come at the cost of a healthy, resilient, and growing economy. We first must embrace a measure of humility as to our ability to project and predict 30-years of energy demand and technological innovation. And we certainly should not make irreversible decisions today to exit critical elements of power stack.

Additionally, we must reject the mindset that it is "*either/or*," and embrace the reality that it is "*both/and*." In fact, the *only* way to confidently move towards a reliable, affordable and clean energy future in Virginia is to go all-in on innovation in nuclear, carbon capture, and new technology like hydrogen generation, along with building on our leadership in offshore wind and solar.

Energy innovation will not just honor our calling to environmental stewardship, it will deliver economic development and job creation opportunities across the Commonwealth, including in Southwest Virginia, where this plan calls for launching a commercial small modular nuclear reactor in the next 10 years.

The release of this plan is the *start* of a conversation about Virginia's Energy Future. It is the start of a movement. We need to push beyond petty politics and execute on a real strategy to provide the reliable, affordable and clean energy economy of tomorrow that Virginia deserves.

I want to thank the hundreds of individuals and groups who had a role in shaping this plan over the past months. Every one of you has a part to play going forward.

Let's get to work.

Sincerely,

A handwritten signature in black ink, reading "Glenn Youngkin". The signature is fluid and cursive, with a prominent "G" and "Y".

Glenn Youngkin

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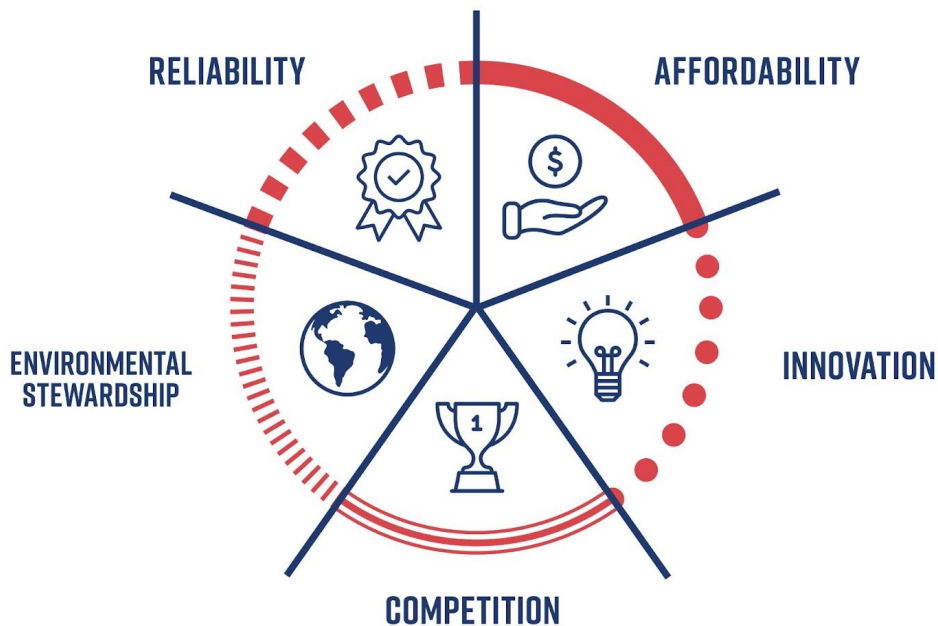
2022 VIRGINIA ENERGY PLAN

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 abundant, reliable, affordable, and clean energy. 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 that 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.

VIRGINIA’S *ENERGY* FUTURE



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. Of course, certainty regarding project cost, timing, and efficiency is critical for ratepayers when assessing any significant wind 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 abundant, reliable, affordable, and clean 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 peaks and troughs 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, a historically strong aspect of Virginia's energy system.

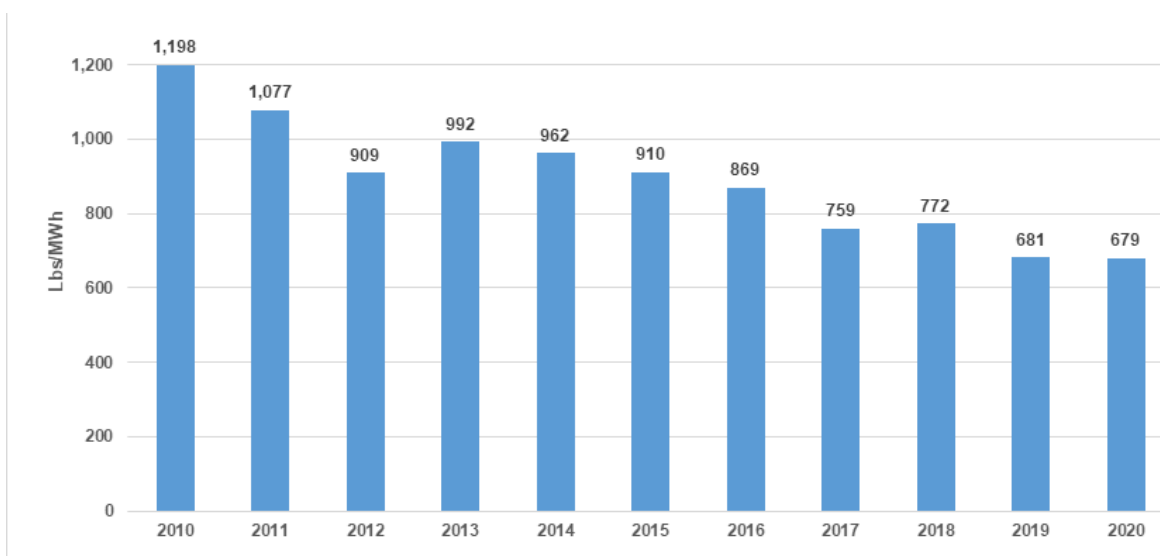
From 2010 to 2020, Virginia's energy consumption grew 2.0% from 123.8 terawatt hours (TWh) to 126.3 TWh. In 2010, Virginia generated 73.0 TWh and imported 50.8 TWh of energy (41.0% of total consumption) through excess power generated by states in Virginia's Regional Transmission Organization (RTO), PJM, which Virginia joined in 2005. Largely driven by the addition of natural gas generation facilities, Virginia grew 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 power from other states.

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

YEAR	BASELOAD/PEAKING					INTERMITTENT			TOTAL
	NUCLEAR	COAL	NATURAL GAS	OTHER	%	WIND	SOLAR	%	
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%

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 4th 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 - 2020⁶



As of December 2021, the Commonwealth had 661 MW of installed wind and solar capacity. These low-cost, intermittent sources comprised 3% of the Commonwealth's power capacity. The majority of the Commonwealth's capacity is comprised of baseload generation sources, such as natural gas (50%) and nuclear (14%). Comparatively, the total capacity mix of PJM includes significantly more coal at 27% (compared to Virginia's 11%), similar levels of nuclear (17%) and intermittent sources (2%), and lower amounts of natural gas (44%).

⁴ [Energy Information Administration. Table 5. Annual Virginia Electricity Profile Data, 2020.](#)

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

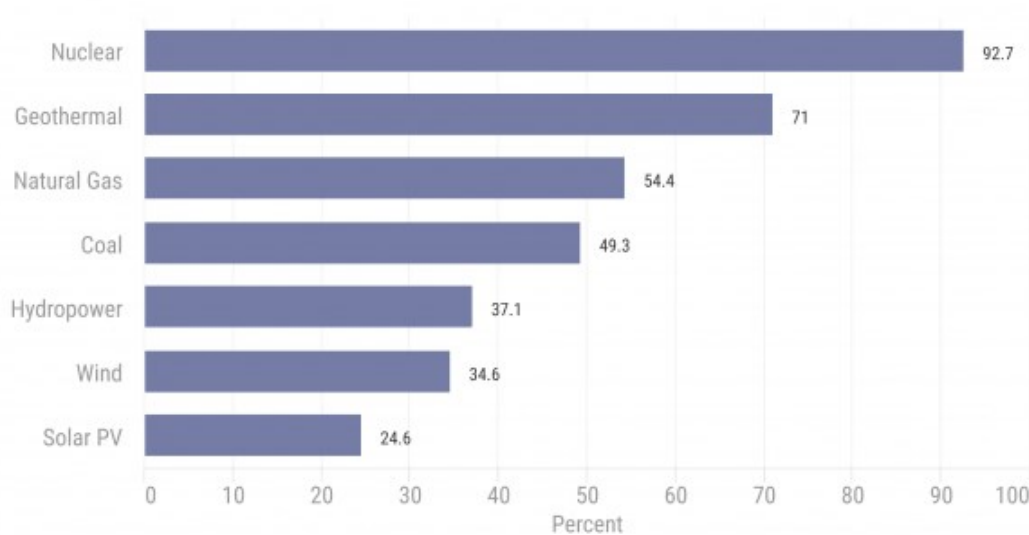
⁶ [Energy Information Administration. Detailed EIA-923 emissions survey data - Electric power industry estimated emissions by state.](#)

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 is required 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 burdens could decline in the future, the Commonwealth needs thoughtful consideration of assumptions to avoid prematurely incorporating utility scale storage into Virginia's generation stack.

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 occur before the full transition to intermittent energy sources and retirement of natural gas generation facilities, and ratepayers will assume the risk of 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, are shown in *Figure 7*, and they 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 removing current baseload capacity.

Figure 7. US Capacity Factor by Energy Source¹⁷



Source: U.S. Energy Information Administration

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.](#)

Figure 9. Virginia Total Annual Energy Generation by Source and Future Portfolio Growth²⁰

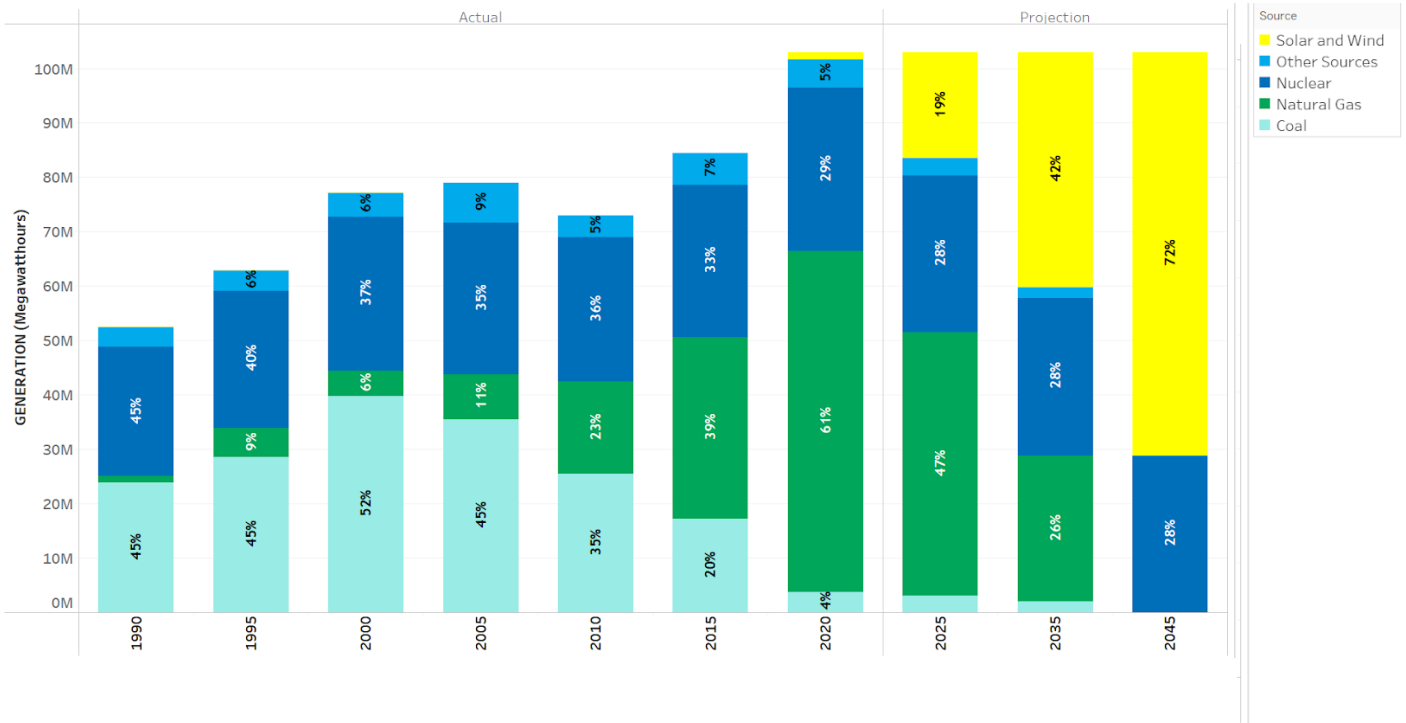
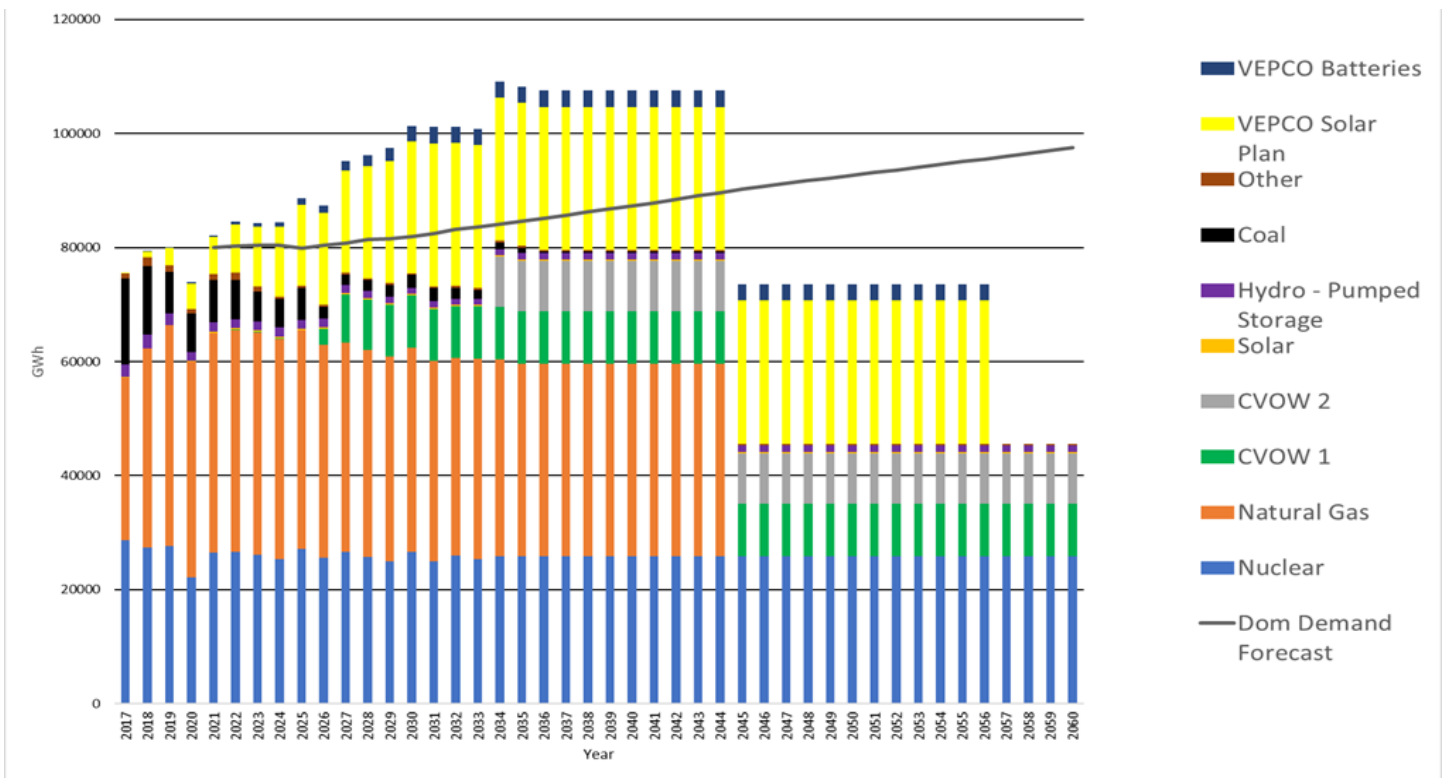


Figure 10. Dominion's Projected Customer Demand Compared to Generation Profile²¹



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

Figure 12. Energy Generation Under VCEA³⁰

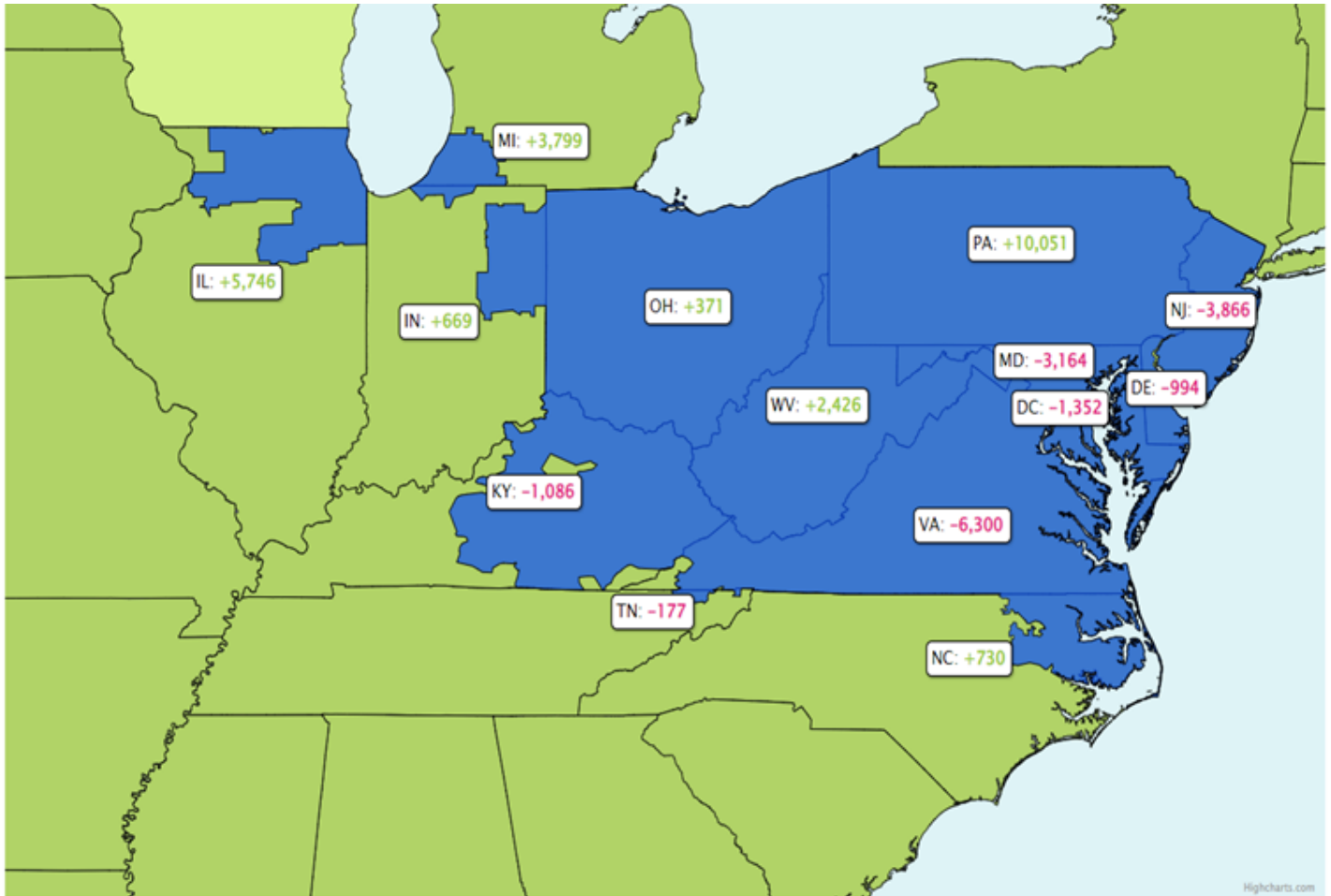
Figure 13. Net Summer Capacity (MW) of Utility Scale Units by Technology³¹

³⁰ [Energy 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. Traditional source includes electricity sourced from coal, hydroelectric, natural gas, other biomass, petroleum, pumped storage, and wood. Renewables reflects electricity sourced from solar and wind. No wind production was recorded in Virginia by the EIA in 2020.

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 PJM states, which are predominantly generated by coal, gas, and nuclear sources as shown in *Figure 13*. Currently, renewable energy represents a much larger percentage of Virginia’s installed capacity in comparison with other PJM states. In 2020, intermittent solar generation represented 4.4% of installed capacity, but only 1.3% of electricity generation, highlighting the distinction between capacity and generation. If Virginia increases its reliance on intermittent generation, the level of electricity imports from other states will increase and expose Virginia to future changes that may occur in net exporting states, such as Illinois, Ohio, Michigan, 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. The PJM forecasts occur annually, 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, this necessitates more frequent localized forecasting to prevent transmission congestion.

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. These pipeline challenges have caused the loss of \$7.8 billion in GDP, resulting in the loss of over 50,000 jobs and \$1.83 billion in 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 connections to 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 has received a deadline extension from the Federal Energy Regulatory Commission (FERC) to become operational 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. In 2022, the Commonwealth issued statements to FERC in support of the completion of MVP, the Commonwealth Energy Connector, 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, the rapid structural changes taking place in the power sector require enhanced efforts to combat cybersecurity vulnerabilities. Our energy future must ensure reliable, secure, and resilient energy and include 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.

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.](#)

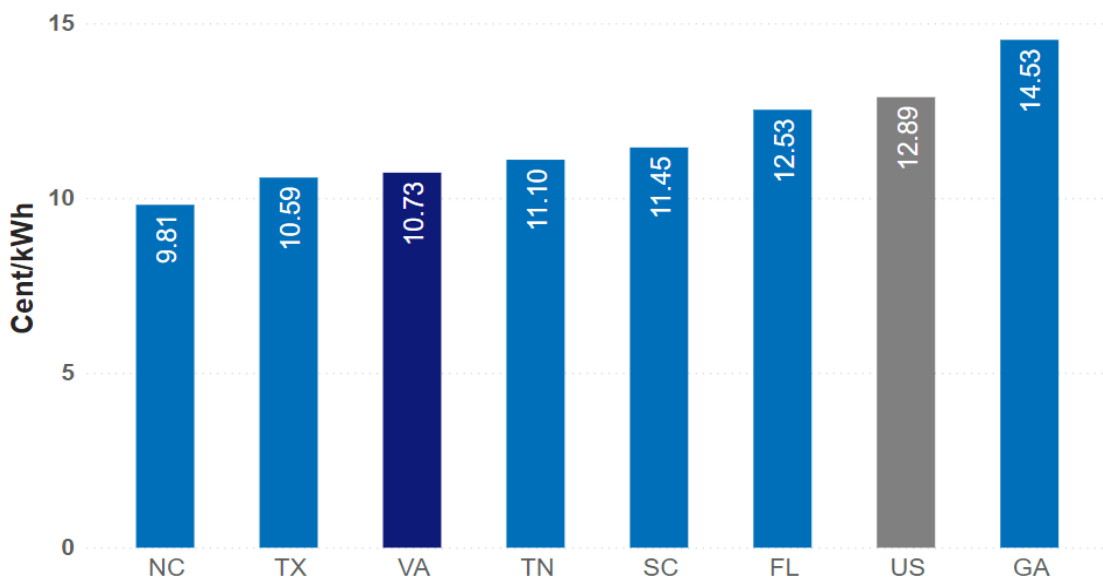
The 2022 Virginia Energy Plan includes several recommendations to preserve Virginia’s grid reliability and ensure Virginia users have access to energy when and where they need it.

- 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 has enjoyed competitive energy rates historically, but electricity 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, but costs are increasing faster than our competitor states, ultimately making Virginia less competitive.

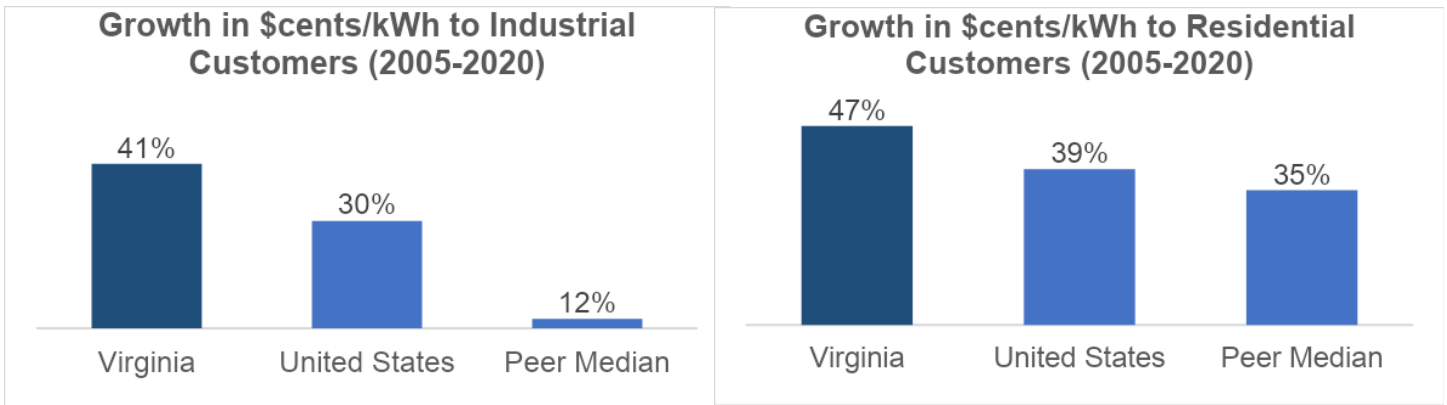
Figure 15. Average Price of Electricity to Customers All Sectors (June 2022)³⁶



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

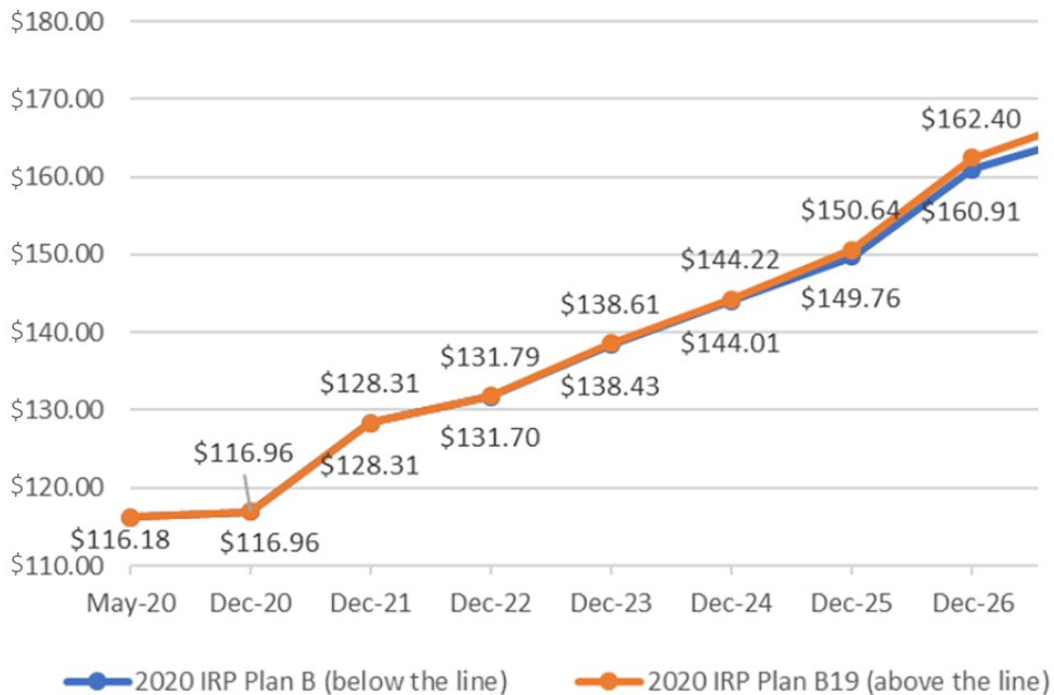
From 2005 to 2020, rates for Virginia residential customers have increased by 47%, compared to 39% nationwide and 35% compared to competitor states.

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



On September 1, 2021, the SCC released their annual report on implementation of the Virginia Electric Utility Regulation Act, as required by statute. This report concluded VCEA will increase energy bills for Virginia ratepayers over \$50 per month (almost \$660 annually) between 2020 and 2030 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 over the last 15 years. 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 a singular 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 UTILITY 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 TI	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		\$ 136.93	\$ 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 bases its rulings on three factors: (1) whether these requests would have any material effect on reliability of existing service; (2) whether these requests are required by public convenience and necessity; and (3) whether these requests 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 such that a finding from the SCC is not required. 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.

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 and assess 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 fleet of nuclear submarines and aircraft carriers. 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 the 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 and calls for developing spent nuclear fuel recycling technologies that offer the promise of a zero-carbon emission energy system with minimal waste and a 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 and meet 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.

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 is in an early stage of development and is very expensive at this time. However, when combined with a meaningful use, CCUS technology can be utilized by other industries, such as 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 within 10 years.
- 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; (6) biomass; and (7) spent fuel recycling.
- Study the creation of incentives to encourage energy infrastructure development for business-ready sites.

COMPETITION

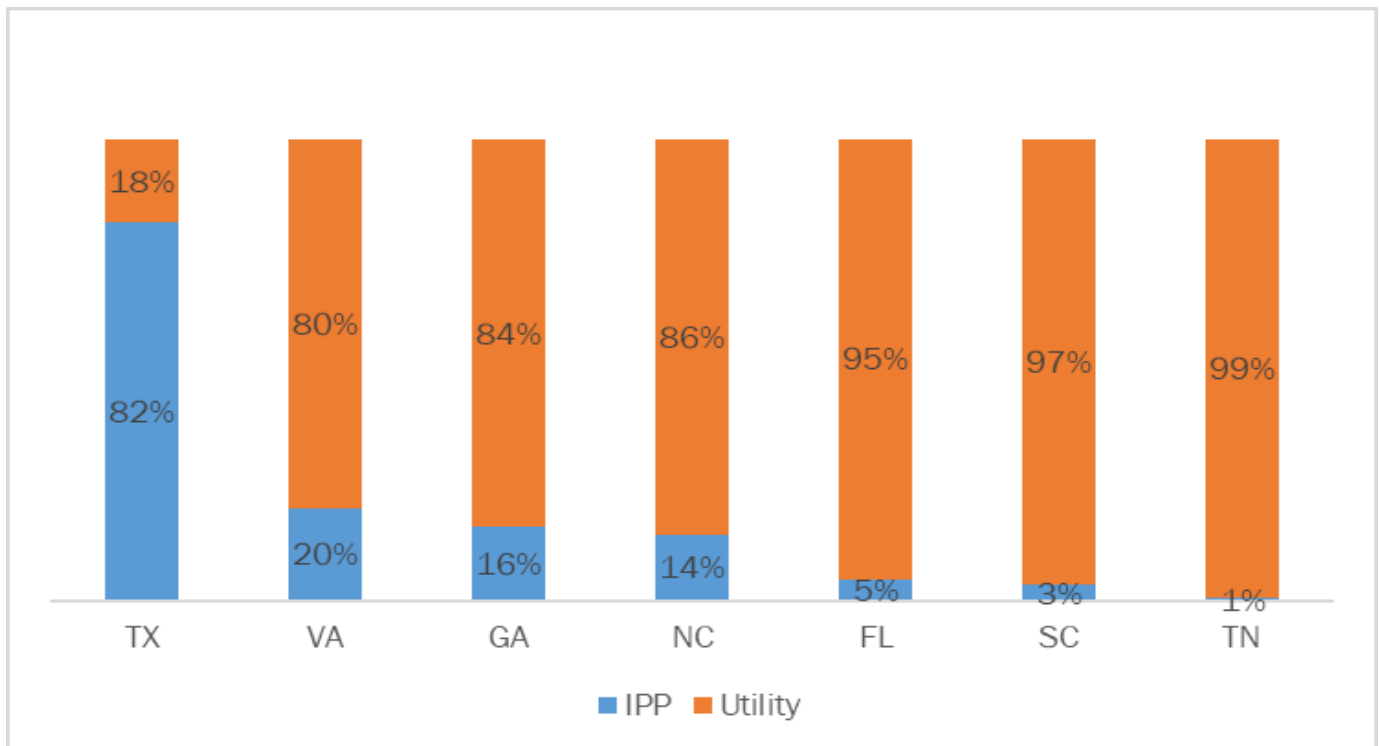
Virginia’s energy consumers receive power through investor-owned utilities granted monopoly territories and regulated by the SCC, which determines if a utility’s investment plans (new facilities, upgrades, etc.) are in the public interest and if the costs associated with the investment are reasonable 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](#); electric utility production, and IPP, commercial and industrial production as a proportion of all generation in the electric industry;

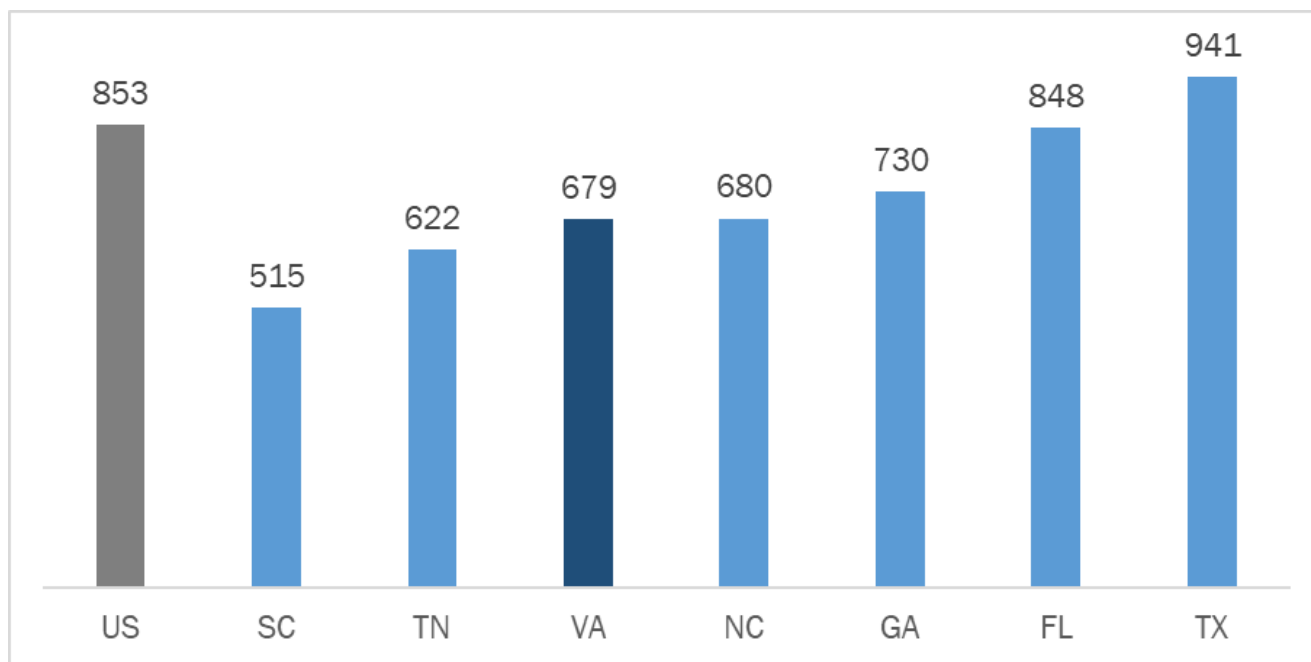
There are several important benefits to Virginia's regulated monopoly model, but current policy unnecessarily restricts certain projects from competition in the energy market. Both businesses and residential customers, enthusiastic about installing their own solar and wind generation units or purchasing electricity from competitive service providers, are overly burdened by regulations that prevent them from exercising even limited 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

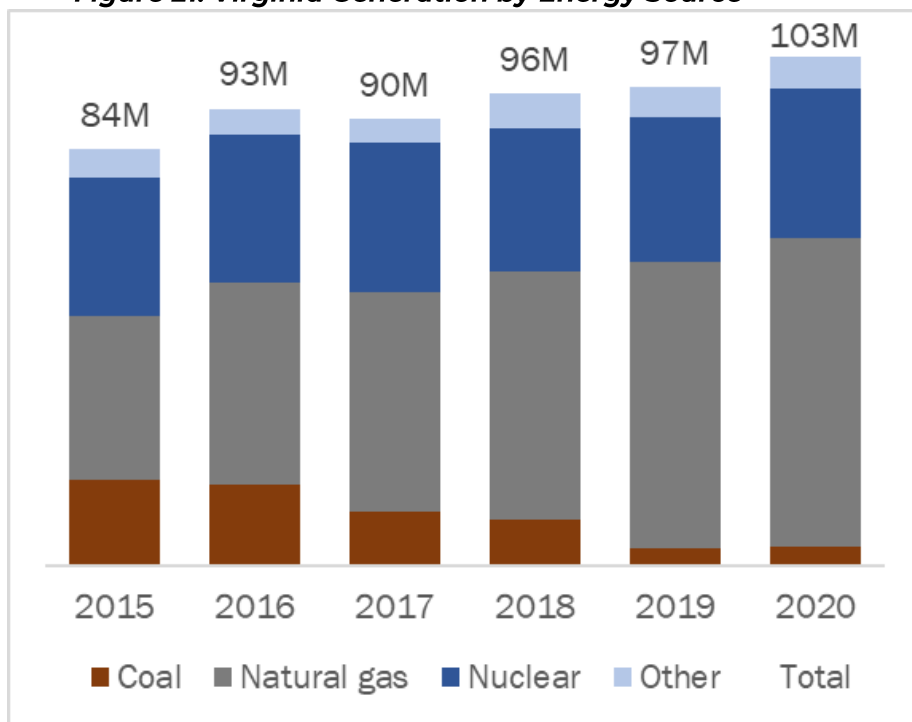
Figure 20. Carbon Dioxide Emission Rates (lbs/MWh) Across Competitor States (2020)⁴²



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 Source⁴³



This shift from coal to low-emission natural gas generation and the reduction of emissions in the Commonwealth occurred prior to Virginia joining RGGI in 2020. Because utilities can directly pass RGGI costs to consumers through a RAC, any “incentive” for utilities to reduce emissions or costs is eliminated. In Virginia, RGGI is simply a tax on ratepayers that does not alter the behavior of electrical utilities and subjects Virginians to the emissions performance of other states. When the Commonwealth is already achieving significant emissions reduction within RGGI, participation in RGGI is a bad deal for Virginia.

Figure 22. Primary Energy Sources and Carbon Dioxide Emissions Rates of Competitor States⁴⁴

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 extends beyond atmospheric emissions. Negative environmental impacts also occur 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.

⁴⁶ [Great Plains Institute. "The True Land Footprint of Solar Energy." September 14, 2021.](#) Solar energy requires roughly 10 acres to produce 1 MW.

2022 ENERGY PLAN



RELIABLE. AFFORDABLE. CLEAN. INNOVATIVE.

VIRGINIA DEPARTMENT OF ENERGY



ACKNOWLEDGEMENTS

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Governor Youngkin would like to thank each organization and individual that provided valuable insight and information as part of the Virginia Energy Plan public outreach.

As part of the stakeholder engagement process, numerous organizations and individuals were able to contribute to the Virginia Energy Plan. Over 750 comments were received from a wide variety of stakeholders that include Academia, State Government, Local Government, Public Commissions, Public Authorities, Advisory Boards, Non-Profits, Private Business, Trade Groups, and other entities. Contributions were also made by over 100 private individuals.

350 Loudoun	Citizens Climate Lobby
ABM Industries	Citizens for Responsible Solar
Advanced Energy Economy	City of Alexandria
AES Clean Energy	City of Charlottesville
Akamai Technologies Inc.	City of Fredericksburg
aMaysing Landscapes	City of Richmond
American Clean Power Association	Clean Energy Advisory Board (CEAB)
American Council for an Energy-Efficient Economy (ACEEE)	Clean Virginia
American Farmland Trust	Climate Action Alliance of the Valley
American Lung Association	Climate Changemakers
American Petroleum Institute	CMA Properties, Inc.
Americans for Prosperity	CMTA, Inc.
Appalachian Power	CO2 Coalition
Appalachian Voices	Coalition for Community Solar Access (CCSA)
Arcadia	Columbia Gas
Archaea Energy	Commission on Electric Utility Regulation
Arlington County	Competitive Power Ventures
Atlas	Conservatives for Clean Energy - Virginia
Berkshire Hathaway Energy GT&S	Corliss Technology Solutions
Blue Wave	Coronado Global Resources
Business Network for Offshore Wind	Covanta Energy
Carter Myers Automotive	Cowboys and Cowgirls of Faith Ministries
Ceres	Cville100
Charlotte County	Danone North America
Chesapeake Climate Action Network	Dominion Energy
Chesapeake Solar & Storage Association (CHESSA)	

Dominion Energy Innovation Center
 Drive Electric RVA
 DRS Architecture
 East Point Energy
 Ecogy Energy
 Electrification Coalition
 Energy Right
 Energy Systems Group
 Environmental Justice Council
 F/V Darana R
 Faith Alliance for Climate Solutions
 Farm Bureau
 Fossil Free Fredericksburg
 Friends of Buckingham
 George Mason University
 Ginter Park Presbyterian Church
 Gupton Marris International, Inc.
 Habitat Middlesex
 Hampton Roads Alliance
 Hampton Roads Business Roundtable
 Hampton Roads Solar Group
 Henrico County
 Home Performance Services
 InterChange Group, Inc.
 Invenergy
 James Madison University
 James River Grazing
 James River Solutions
 Jo-Kell Inc.
 Koulomb Fast EV Charging
 L.C. Heating, A/C & Electrical
 Leaders in Energy
 League of Women Voters
 Lightbridge Corporation
 Loudoun Climate Project
 LS Power
 Lunenburg County
 Lutron
 MAREC Action (Mid-Atlantic Renewable Energy Coalition)
 Mars, Inc. Nestlé Siemens USA Virginia
 Martin Family Farm
 McGuireWoods Consulting LLC
 Metallurgical Coal Producers Alliance
 Mid-Atlantic Pipe Trades Association
 MITRE Corp. Moseley Architects
 Moseley Architect
 Mount Fair Vineyard LLC
 Mt. Rogers Trail Coalition
 NAACP - Virginia
 National Rural Electric Cooperative Association (NRECA)
 Natural Resources Defense Council (NRDC)
 Nestlé
 New Energy Equity
 New Virginia Majority
 Norfolk Solar LLC
 Northern Virginia Regional Commission
 NuScale
 Our Children's Trust
 Paramount Greenhouse & Nursery, Inc.
 Piedmont Environmental Council
 PlanRVA
 Power for Tomorrow
 Powhatan Republican Committee
 Preserve Bent Mountain
 Private landowners
 Propane Education and Resource Council
 Quaker Baptist Church
 Rappahannock Rural Electric Coop
 Real Solar Energy Power Generation System
 Recurve
 ReInvent Hampton Roads
 Resilient Virginia

Retail Energy Advancement League	Virginia Chamber of Commerce
Retail Energy Choice	Virginia Civic Engagement Table (VCET)
Roanoke Gas Company	Virginia Clean Cities (VCC)
Savion	Virginia Coal and Energy Commission
Sealing & Maintenance Products	Virginia Commonwealth University (VCU)
Secure Futures	Virginia Community College System (VCCS)
Shenandoah Valley Soil & Water Conservation District	Virginia Conservation Network (VCN)
Shift Sustainability Consulting	Virginia Department of Agricultural and Consumer Services (VDACS)
Shockoe Solar, LLC	Virginia Department of Emergency Management (VDEM)
Siemens Gamesa Renewable Energy	Virginia Department of Energy (Virginia Energy)
Siemens USA	Virginia Department of Environmental Quality (DEQ)
Sierra Club	Virginia Department of Forestry (DOF)
Solar and Energy Storage Authority	Virginia Department of Housing and Community Development (DHCD)
Solar Energy Industries Association (SEIA)	Virginia Department of Transportation (VDOT)
Solar United Neighbors (SUN)	Virginia Economic Development Partnership (VEDP)
Solar Workgroup of Southwest Virginia	Virginia Education Association (VEA)
Southeastern Wind Coalition	Virginia Energy Efficiency Council (VAEEC)
Southwest Virginia Energy R&D Authority	Virginia Energy Workforce Consortium (VEWC)
Southern Environmental Law Center (SELC)	Virginia Council on Environmental Justice
Sparrow Ventures	Virginia Farm Bureau Federation
Spectrum Engineering LLC	Virginia Forest Products Association
St Paul's Memorial Church	Virginia Forestry Association
State Corporation Commission (SCC)	Virginia Interfaith Power and Light
Suburban Virginia Republican Coalition	Virginia Manufacturers Association
Sustainable Design Consulting	Virginia Maritime Association
The Bent Mountain Center	Virginia Natural Gas
The Nature Conservancy	Virginia Nuclear Energy Consortium (VNEC)
Third Act Virginia	Virginia Nuclear Energy Consortium Authority (VNECA)
ThompsonMcMullen	Virginia Offshore Wind Development Authority (VOWDA)
UA Local 5 Plumbers and Gasfitters	Virginia Oil and Gas Association
Unitarian Universalist Church	Virginia Organizing
United Association of Plumbers and Steamfitters	Virginia Petroleum and Convenience Marketers Association (VPCMA)
University of Virginia	
Virginia Agribusiness Council	
Virginia Association of Counties (VACo)	
Virginia Auto Dealers Association	

Virginia Poverty Law Center (VPLC)
Virginia Propane Gas Association (VAPGA)
Virginia Recycles Used/Spent Nuclear Fuel
Virginia Renewable Energy Alliance (VA-REA)
Virginia Small Business Financing Authority
Virginia Tech
Virginia Transit Association
Virginia Wesleyan University
Virginia, Maryland & Delaware Association of
Electric Cooperatives (VMDAEC)
Virginians for High Speed Rail
Viridiant
Washington Gas
Waste to Energy Now
Waynesboro Nurseries
Waynesboro Republican Committee
Wells Fargo
Wesleyan University Worthen Industries
Winthrop Management
Wood Fuel Developers LLC
Worthen Industries