

# VIRGINIA ENERGY MARKET AND PLANNING PROGRAM BASELINE ASSESSMENT

Phase two of the E-MAP program is to establish baseline analysis of market design, policy incentives, technical requirements, grid reliability, resilience, and opportunities across the electricity sector.

Commonwealth of  
Virginia

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Minerals and Energy

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## **Overview**

The goal of the Virginia Energy Market and Planning (E-MAP) program is to help states develop comprehensive approaches to advancing electric system and related energy infrastructure modernization, resilience, and affordability. The E-MAP program will provide assistance to the Virginia Department of Mines, Minerals and Energy (DMME) to develop a baseline assessment that takes a comprehensive view across the electric system to include advances in laws and regulations, renewable energy, emerging technologies, ancillary services, and energy efficiency with the aim of fostering market innovation and ensuring a reliable, affordable, and environmentally sustainable electric system (NASEO Statement of Work).

## **State Energy Landscape**

Virginia's energy landscape has been described as "complex and comprised of diverse infrastructure components."<sup>1</sup> This is likely because the state is home to three investor-owned utilities (IOU), thirteen electric cooperatives, sixteen municipal utilities, and an even more diverse energy generation portfolio.<sup>2</sup> Virginia has a total net generation of 6,764 MWh, which represents 2.1 percent of total U.S. generation. This net generation includes 48.9 percent from natural gas, 32.2 percent from nuclear, 11.7 percent from coal, 7.2 percent from renewables, and 0.8 percent from petroleum-fired plants.<sup>3</sup>

Despite this net generation and diverse portfolio, Virginia's energy consumption is more than twice the state's energy production, with up to 45 percent of Virginia's electric supply coming from power generated out-of-state, primarily from neighboring states.<sup>4</sup> However, approximately 90 percent of the total supply of energy to Virginia's IOU customers is produced from facilities under the State Corporation Commission's (SCC) rate setting jurisdiction.<sup>5</sup>

The transportation sector is Virginia's largest energy consumer, accounting for 29.4 percent or 696.5 trillion Btu's of total energy consumed. The state has the third-largest state-maintained transportation network in the nation, including six major interstate highways, more than a dozen railroads that operate on 3,500 miles of railway in the state, and two of the nation's busiest commercial airports and one of the nation's largest seaports. The commercial sector accounts for 26 percent of total energy consumed, while the residential sector is the third largest at 25.8 percent. The industrial sector is the smallest at 18.8 percent or 445.5 trillion Btu's.<sup>6</sup>

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<sup>1</sup> "Energy Assurance Plan," SAIC, 2012, pg. 8,

<https://www.dmme.virginia.gov/de/LinkDocuments/EnergyAssurancePlan.pdf>

<sup>2</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

<sup>3</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, <https://www.eia.gov/state/?sid=VA>.

<sup>4</sup> U.S. Energy Information Administration, State Energy Production Estimates, 1960 through 2014, June 29, 2016, [https://www.eia.gov/state/seds/sep\\_prod/SEDS\\_Production\\_Report.pdf](https://www.eia.gov/state/seds/sep_prod/SEDS_Production_Report.pdf).

<sup>5</sup> Virginia State Corporation Commission, Implementation of the Virginia Electric Utility Regulation Act, 2017, September 1, 2017, pgs. 11-12, [https://www.scc.virginia.gov/comm/reports/2017\\_veurcomb.pdf](https://www.scc.virginia.gov/comm/reports/2017_veurcomb.pdf).

<sup>6</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Consumption & Expenditures, <https://www.eia.gov/state/data.php?sid=VA#ConsumptionExpenditures>.

Virginia has no appreciable crude oil reserves and produces only a small amount of crude oil, roughly 0.1 BTUs, from wells in the far southwestern region of the state. There are no operating petroleum refineries in the state, and Virginia is not crossed by any major crude oil pipelines. Refined petroleum products arrive in the state by pipeline and seaports. Two major petroleum product pipelines, the Colonial Pipeline and the Plantation Pipeline, deliver refined petroleum products to locations across Virginia.

Virginia is home to coalbed methane fields that are among the nation's top 100 natural gas fields, and the state contains one-sixth of U.S. coalbed methane reserves.<sup>7</sup> The natural gas fields are located in seven counties in the southwestern region of the state. While Virginia's natural gas production has increased substantially during the past three decades, production still equals roughly one-fourth of the state's demand.<sup>8</sup> Most of Virginia's natural gas supply is delivered by several major interstate natural gas pipelines. Natural gas consumption by Virginia's electric power generators has risen sharply since 2003, increasing more than eight-fold by 2016, when the electric power sector accounted for almost three-fifths of the natural gas delivered to consumers in the state. By 2016, the electric power sector consumed more natural gas than the other end-use sectors combined. The industrial sector is the second-largest natural gas-consuming sector in Virginia followed by the residential sector, where one in three households uses natural gas for home heating.<sup>9</sup>

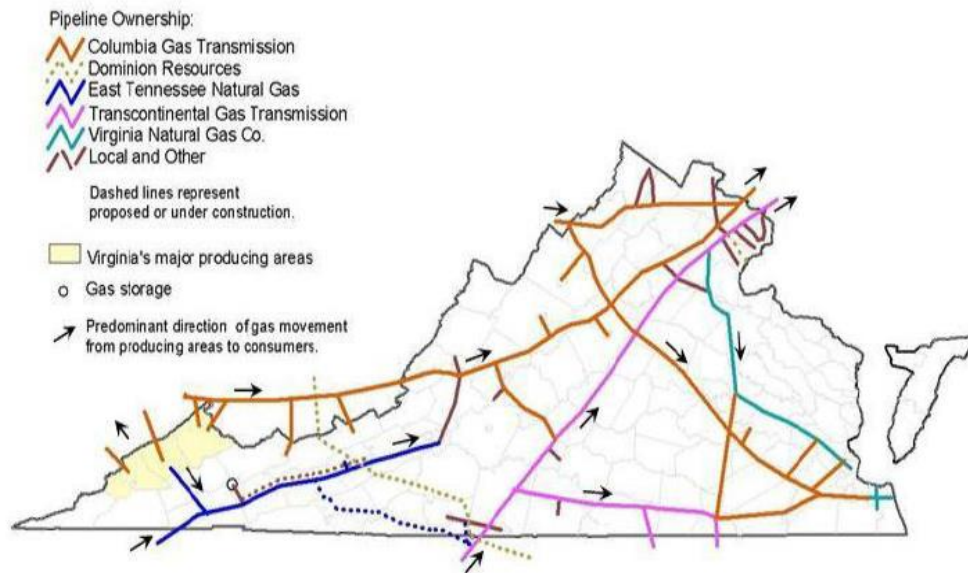


Figure 1 Natural Gas Pipelines in Virginia<sup>10</sup>

<sup>7</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural gas, <https://www.eia.gov/state/analysis.php?sid=VA>.

<sup>8</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural Gas, <https://www.eia.gov/state/data.php?sid=VA#ConsumptionExpenditures>.

<sup>9</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Consumption & Expenditures, <https://www.eia.gov/state/data.php?sid=VA#ConsumptionExpenditures>.

<sup>10</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

Virginia has more than 60 active coal mines with annual coal production being less than two percent of the nation's total.<sup>11</sup> In 2015, coal mine operators in Virginia produced about 13.3 million tons. The majority of the coal mined in Virginia is bituminous, and about four-fifths of that is exported to other states and nations. The remaining coal is used in-state, primarily by electric power generators and coke plants.<sup>12</sup>

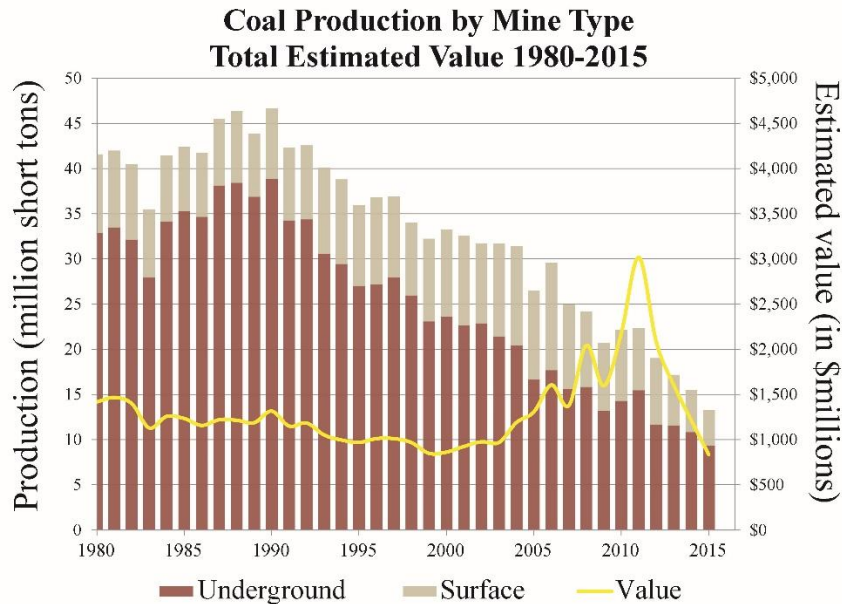


Figure 2 Annual Coal Production in Virginia by Mine Type and Estimated Value.<sup>13</sup>

Renewable energy has a rapidly growing footprint in Virginia. Hydroelectric power, including pumped hydroelectric storage, is the renewable resource with the greatest generating capacity in Virginia. However, in 2015, Virginia had more installed capacity for generating electricity from biomass than from hydropower, and in 2016, biomass fueled almost 5 percent of the state's total net electricity generation.<sup>14</sup> Wood and wood waste, municipal solid waste, and landfill gas are the most common forms of biomass used in Virginia. Hydroelectric generation is variable and typically contributes less than 2 percent of Virginia's net electricity generation. The state has both conventional and pumped hydroelectric facilities. Virginia also houses the largest pumped hydroelectric storage facility in the world, Bath County Pumped Storage Station, with a net generating capacity of 3,003-megawatts.

Solar has grown exponentially. In 2012, installed solar was essentially non-existent in Virginia. As prices declined and state policies were changed, solar deployment exploded. In 2015, an estimated 25 to 30 MWs were installed across residential, commercial, and utilities

<sup>11</sup> U.S. EIA, Annual Coal Report 2015 (November 2016), Table 1, Coal Production and Number of Mines by State and Mine Type, 2015 and 2014

<sup>12</sup> U.S. EIA, Annual Coal Report 2015 (November 2016), Table 26, U.S. Coal Consumption by End Use Sector, Census Division, and State, 2015 and 2014.

<sup>13</sup> Department of Mines, Minerals and Energy, Coal Production in Virginia, <https://www.dmme.virginia.gov/dgmr/coal.shtml>.

<sup>14</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Renewable Energy, <https://www.eia.gov/state/analysis.php?sid=VA>.

properties. However, in 2016, 192.4 MWs were installed, primarily utility-scale projects to satisfy growing commercial needs. For example, in October 2016, the 80 MW Amazon-Dominion Solar Farm, which was the largest solar farm in the mid-Atlantic region at that time, went into service on Virginia's Eastern Shore.<sup>15</sup> For 2017, an estimated 241.5 MWs will be installed.<sup>16</sup> In May, 2017, Governor McAuliffe reported that Virginia has a total of more than 1,800 MWs of solar installed or under development.<sup>17</sup>

There are currently no installed wind projects in the state, either land-based or off-shore. However, plans are moving forward for 25 wind turbines, totaling 75-to-80 MWs, located in a remote section of northern Botetourt County.<sup>18</sup> In addition, Dominion announced in July, 2017, that the Company will move ahead with two 6 MW turbines 27 miles off the coast of Virginia Beach.<sup>19</sup>

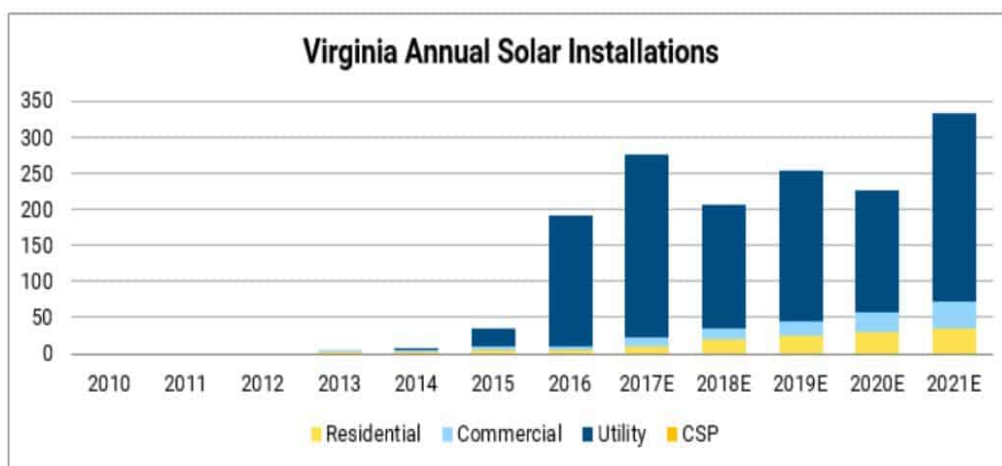


Figure 3 Solar Growth in Virginia<sup>20</sup>

Some of this new renewable energy generation is a result of Virginia establishing a voluntary renewable portfolio standard (RPS) goal to encourage IOUs to procure a portion of the electricity sold in Virginia from renewable energy resources. The RPS goal is for 15 percent of base year 2007 sales to come from eligible renewable energy sources by 2025. The state also enacted a mandatory utility green power option in 2007 that gives electric utility customers the option of purchasing 100 percent of their electricity from renewable energy sources. If a utility does not offer a program that meets the 100 percent renewable energy requirement, its customers can purchase green power from any licensed retail supplier.<sup>21</sup>

<sup>15</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural gas, <https://www.eia.gov/state/analysis.php?sid=VA>.

<sup>16</sup> "Virginia Solar." Solar Energy Industries Association. <https://www.seia.org/state-solar-policy/virginia-solar>.

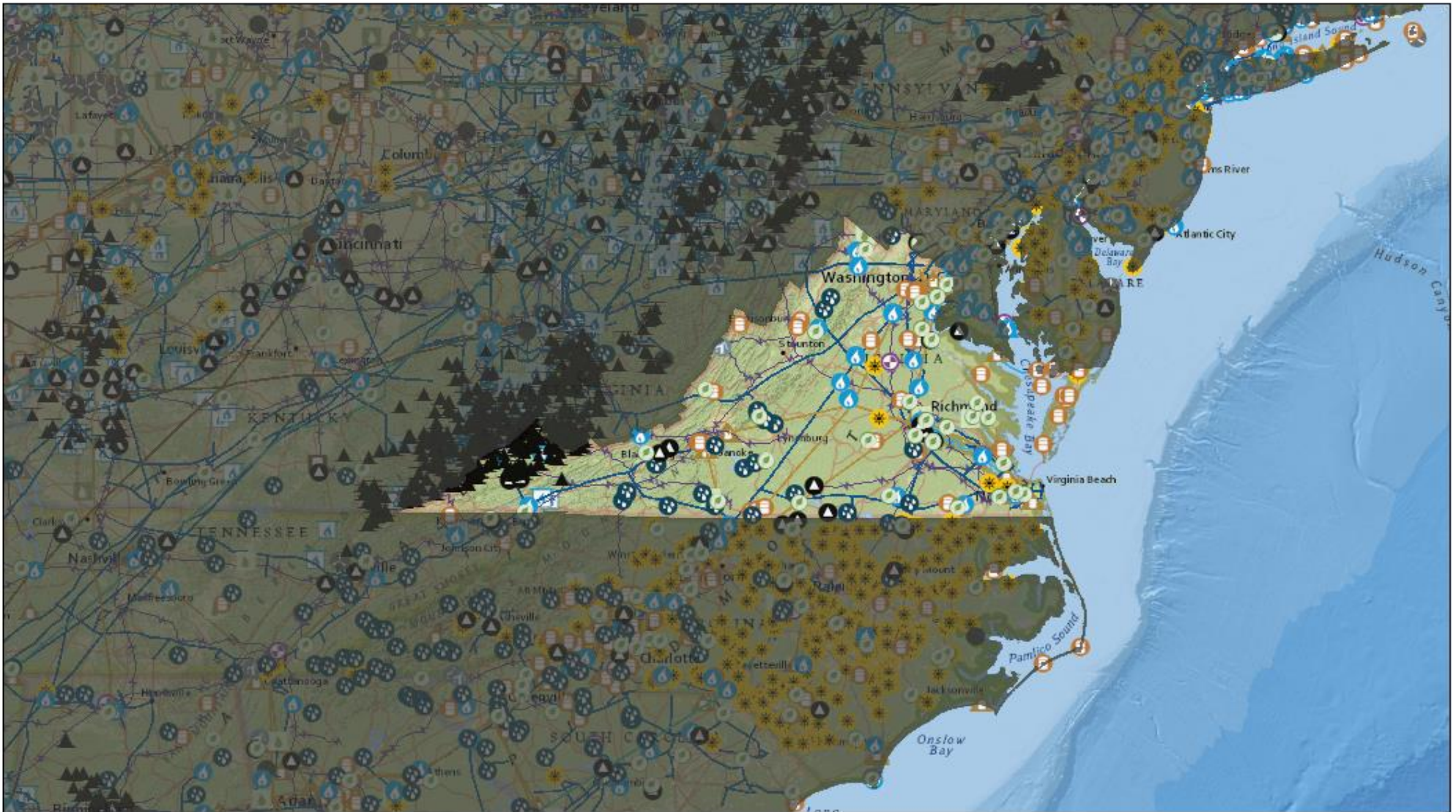
<sup>17</sup> Main, Ivy. "2017 guide to Virginia wind and solar policy." Sierra Club. June 30, 2017. Accessed December 27, 2017. <http://www.sierraclub.org/virginia/blog/2017/06/2017-guide-virginia-wind-and-solar-policy>.

<sup>18</sup> Chandler, Kevin. "Virginia's Rocky Forge Wind Farm Approved." Apex Clean Energy. March 2, 2017. <https://www.apexcleanenergy.com/news/virginias-rocky-forge-wind-farm-approved/>.

<sup>19</sup> Frangoul, Anmar. "Dominion Energy Virginia and Dong Energy move forward with offshore wind project." CNBC. July 11, 2017. <https://www.cnbc.com/2017/07/11/dominion-energy-and-dong-energy-offshore-wind-project.html>.

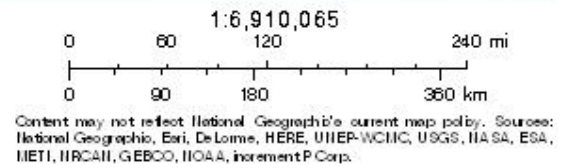
<sup>20</sup> "Virginia Solar." Solar Energy Industries Association. <https://www.seia.org/state-solar-policy/virginia-solar>.

<sup>21</sup> U.S. Department of Energy, Mandatory Utility Green Power Option, Virginia, accessed July 9, 2017.



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|--|--|---|--|
|  State Mask            |  Biomass Power Plant    |  Hydroelectric Power Plant |  Other Power Plant          |
|  Surface Coal Mine     |  Coal Power Plant       |  Natural Gas Power Plant   |  Petroleum Power Plant      |
|  Underground Coal Mine |  Geothermal Power Plant |  Nuclear Power Plant       |  Pumped Storage Power Plant |



## **Electric Utility Providers**

### **Investor-Owned Utilities**

Virginia's three investor-owned utilities include Dominion Energy, which is a subsidiary of Dominion Resources, Inc.; Appalachian Power Company, which is a subsidiary of American Electric Power Company; and Kentucky Utilities Company, which is a subsidiary of PPL Corporation. All three investor-owned utilities are members of the PJM Interconnection and are under the Commission's rate setting jurisdiction.

Dominion Energy is the largest investor-owned utility in the state, providing electricity to 66.9% of the state's consumers. Headquartered in Richmond, VA, Dominion Energy recently changed its name from Dominion Virginia Power in a rebranding effort to better reflect its evolving role in the energy marketplace.<sup>22</sup> The company serves 2.5 million customers between North Carolina and Virginia, and more than 5 million utility and retail energy customers across 14 states. Dominion has an operating revenue of \$11.7 billion and a market capitalization of \$40.3 billion.<sup>23</sup> The company employs 14,743 with 3,960, or 27 percent, dedicated to Virginia.<sup>24</sup>

Dominion's current generation fleet in Virginia and North Carolina consists of four nuclear, 12 coal, four natural gas-steam, 10 combined-cycle power plants, 41 combustion turbines, four biomass, two heavy oil, six pumped storage, 14 hydro units, and three solar units. The total summer capacity for these units is approximately 19,602 MWs.<sup>25</sup> The total electric generating capacity for the entire company across 14 states is 25,700 MWs.

Appalachian Power Company (APCo) is the second largest investor-owned utility, providing electricity to 14.6 percent of the state's consumers. Headquartered in Charleston, West Virginia, the company serves about 1 million customers in West Virginia, Virginia, and Tennessee. American Electric Power (AEP) system, the parent company, delivers electricity to more than 5 million customers across 11 states. APCo has an operating revenue of \$3 billion and employs 3,350. The company has a generation fleet that consists of three coal power plants, three natural gas plants, nine hydro units, and one pumped storage unit. The total capacity for these units totals 8,146.5 MWs.<sup>26</sup>

The smallest of the IOUs in Virginia is Kentucky Utilities Company, which is under the name of Old Dominion Power (ODP), and provides electricity to about 0.8 percent of the state's consumers, or about 28,000 customers in five counties -- Wise, Lee, Russell, Scott, and

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<sup>22</sup> Blackwell, John Reid. "Dominion Resources plans to change name to Dominion Energy." Richmond Times-Dispatch. February 06, 2017. [http://www.richmond.com/business/local/dominion-resources-plans-to-change-name-to-dominion-energy/article\\_c5f33ad6-75f5-5a5a-be5d-dbbfee119d05.html](http://www.richmond.com/business/local/dominion-resources-plans-to-change-name-to-dominion-energy/article_c5f33ad6-75f5-5a5a-be5d-dbbfee119d05.html).

<sup>23</sup> "Citizenship Report 2015-2016," Dominion Energy. About us, pg. 3, [http://www.domcitizenship.com/assets/pdf/Dominion\\_CR\\_About\\_Us\\_102016.pdf](http://www.domcitizenship.com/assets/pdf/Dominion_CR_About_Us_102016.pdf).

<sup>24</sup> "Citizenship Report 2015-2016," Dominion Energy. About us, pg. 5, [http://www.domcitizenship.com/assets/pdf/Dominion\\_CR\\_About\\_Us\\_102016.pdf](http://www.domcitizenship.com/assets/pdf/Dominion_CR_About_Us_102016.pdf).

<sup>25</sup> "Virginia Electric and Power Company's Report of Its Integrated Resource Plan," Dominion Energy, May 1, 2017, pg. 30, <https://www.dominionenergy.com/library/domcom/pdfs/corporate/2017-irp.pdf>.

<sup>26</sup> "Appalachian Power Fact Sheet." Appalachian Power. June 2017. <https://www.appalachianpower.com/global/utilities/lib/docs/info/facts/factsheets/APCoOverallFactSheet6-17.pdf>.



Dickenson County. While Kentucky Utilities serves over 900,000 with over 8,000 MWs of combined generating capacity for its entire service territory, the company does not own or operate any generating assets in Virginia at this time.<sup>27</sup>

## Public Power Utilities

### Cooperatives

There are currently thirteen electric cooperatives in Virginia, serving approximately 17.8 percent of the electric customers in the Commonwealth.<sup>28</sup> The thirteen electric cooperatives are Central Virginia Electric Cooperative; Craig-Botetourt Electric Cooperative; Northern Virginia Electric Cooperative; Powell Valley Electric Cooperative; A&N Electric Cooperative; BARC Electric Cooperative; Community Electric Cooperative; Mecklenburg Electric Cooperative; Northern Neck Electric Cooperative; Prince George Electric Cooperative; Rappahannock Electric Cooperative; Shenandoah Valley Electric Cooperative; and Southside Electric Cooperative. All but the first four are distribution cooperatives that are members of the electric generation and transmission cooperative operating as Old Dominion Electric Cooperative (ODEC), which is also a member of PJM Interconnection.<sup>29</sup> The individual member co-ops are regulated by the SCC, but ODEC is regulated by the Federal Energy Regulatory Commission (FERC).<sup>30</sup>

ODEC serves its members' power supply needs by providing owned and purchased power to the distribution cooperatives. Currently, ODEC is a joint owner with Dominion Energy of a nuclear facility and a coal-fired facility. ODEC owns 11.6 percent, or 208 MWs, of the 1,800 MW North Anna nuclear generating station and 50 percent of coal-fired 850 MW Clover Power station, or 416 MW.<sup>31</sup> Combined, these two resources supply approximately half of the members' power supply needs. The remaining need is provided by purchasing additional wholesale power under FERC regulated tariffs. Four other Virginia cooperatives purchase power via bilateral contracts with various providers, such as IOUs or non-utility generators. In 2010, ODEC acquired interests in hydro, landfill gas, and wind power facilities. In addition, ODEC owns transmission lines and delivers electricity via power lines that Dominion Energy, Appalachian Power, and Delmarva Power operate in Delaware, and Allegheny Power Company operates in Maryland, respectively.<sup>32</sup>

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<sup>27</sup> “Kentucky Utilities Company d/b/a Old Dominion Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq., Case No. PUR-2017-00056,” May 1, 2017, pg. 1, <http://www.scc.virginia.gov/docketsearch/DOCS/3%23tq01!.PDF>.

<sup>28</sup> Virginia State Corporation Commission, Implementation of the Virginia Electric Utility Regulation Act, 2016, September 1, 2016, pgs. 2, [https://www.scc.virginia.gov/comm/reports/2016\\_veur.pdf](https://www.scc.virginia.gov/comm/reports/2016_veur.pdf).

<sup>29</sup> Virginia State Corporation Commission, Implementation of the Virginia Electric Utility Regulation Act, 2016, September 1, 2016, pgs. 2, [https://www.scc.virginia.gov/comm/reports/2016\\_veur.pdf](https://www.scc.virginia.gov/comm/reports/2016_veur.pdf).

<sup>30</sup> Virginia State Corporation Commission, Implementation of the Virginia Electric Utility Regulation Act, 2007, September 9, 2007, pgs. 2, <https://www.scc.virginia.gov/comm/reports/restrct4.pdf>

<sup>31</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

<sup>32</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

## **Municipal Utilities**

There are 16 municipal electric utilities serving approximately 161,000 retail customers. The municipal electric utilities are City of Bedford; Town of Blackstone; City of Bristol; Town of Culpeper; City of Danville; Town of Elkton; City of Franklin; Town of Front Royal; Harrisonburg Electric Commission; City of Manassas; City of Martinsville; City of Radford; Town of Richlands; City of Salem; Virginia Polytechnic Institute & State University; and Town of Wakefield. Most municipals own very limited generation. Some own small solar, hydro, oil, diesel, and landfill gas generation. In total, municipals electric utilities self-generate less than five percent of the power sold to retail customers.<sup>33</sup> The remaining electricity is purchased through wholesale power supply contracts from IOUs or on the PJM Interconnection.<sup>34</sup>

## **Virginia State Corporation Commission**

The SCC is Virginia's regulatory authority over utilities, insurance, state-chartered financial institutions, securities, retail franchising and railroads. It is the state's central filing office for corporations, limited partnerships, limited liability companies and Uniform Commercial Code liens. The SCC is an independent branch of state government with delegated administrative, legislative and judicial powers. It acts as a court of record and holds formal hearings when warranted. SCC decisions can only be appealed to the Virginia Supreme Court.<sup>35</sup>

The SCC's Division of Public Utility Regulation is responsible for reviewing rate applications filed by investor-owned utilities and member-owned cooperatives and preparing testimony for rate cases before the Commission; monitoring utility construction projects and reviewing applications for construction of transmission lines 138 kilovolts and above, electric generating units, and intra-state natural gas pipelines; monitoring distribution system performance of electric utilities; reviewing rates and costs, and enforcing general regulations and service standards; certifying competitive local exchange and interexchange carrier telephone service providers; managing communications company interconnection agreements; investigating consumer complaints regarding electric, natural gas, water and sewer utilities, and communications companies under the SCC's jurisdiction, and providing expert technical assistance and public policy recommendations relative to the Virginia Electric Utility Regulation Act.<sup>36</sup>

## **PJM Interconnection**

PJM is an independent service operator (ISO); as such it has been designated by the FERC as a regional transmission organization (RTO) that manages the interstate high voltage electric delivery system, as well as coordinating and creating a forward pricing market for

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<sup>33</sup> Harrisonburg Electric Commission, Municipal Electric Power Association of Virginia, by Brian O'Dell, July 13, 2015, [http://services.dlas.virginia.gov/User\\_db/frmView.aspx?ViewId=4361&s=7](http://services.dlas.virginia.gov/User_db/frmView.aspx?ViewId=4361&s=7).

<sup>34</sup> Harrisonburg Electric Commission, Municipal Electric Power Association of Virginia, by Brian O'Dell, July 13, 2015, [http://services.dlas.virginia.gov/User\\_db/frmView.aspx?ViewId=4361&s=7](http://services.dlas.virginia.gov/User_db/frmView.aspx?ViewId=4361&s=7).

<sup>35</sup> "State Corporation Commission," Commonwealth of Virginia, , <https://www.virginia.gov/agencies/state-corporation-commission/>.

<sup>36</sup> "Responsibilities," Virginia SCC - Division of Public Utility Regulation, <https://www.scc.virginia.gov/pur/resp.aspx>.

electric power within its region. PJM works closely with other ISOs such as the Midwest, New York, and New England ISOs to provide enhanced reliability for the electricity transmission system in the entire Mid-Atlantic and northeastern United States. PJM also sets market rules related to the purchase of wholesale power, and has emergency management protocols and capacity retention tools. PJM is charged with the responsibility of assuring the reliability of the transmission grid in its territory. PJM also assesses the ongoing reliability of transmission facilities throughout the Commonwealth.<sup>37</sup>

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<sup>37</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8-2, PJM Interconnection, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

# Electric Service Territories

## Electric Utilities

### Investor Owned Utilities

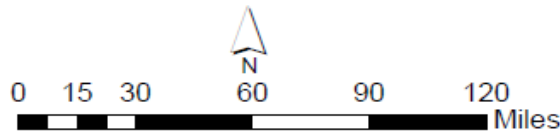
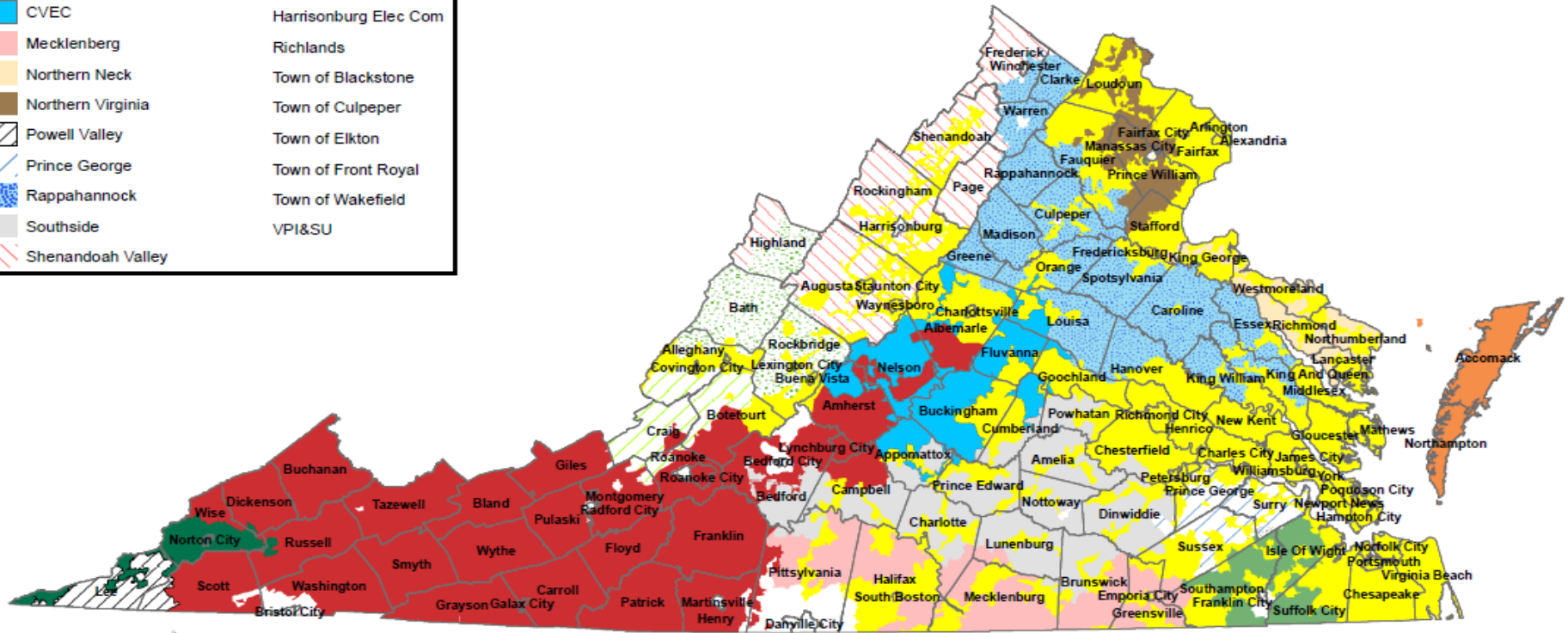
- APCo
- Kentucky Utilities
- Dominion Virginia Power

### Electric Cooperatives

- A&N
- BARC
- Craig Botetourt
- Community
- CVEC
- Mecklenberg
- Northern Neck
- Northern Virginia
- Powell Valley
- Prince George
- Rappahannock
- Southside
- Shenandoah Valley

### Non-Jurisdictional Utilities

- Bristol Power Board
- City of Bedford
- City of Danville
- City of Manassas
- City of Martinsville
- City of Radford
- City of Salem
- Franklin
- Harrisonburg Elec Com
- Richlands
- Town of Blackstone
- Town of Culpeper
- Town of Elkton
- Town of Front Royal
- Town of Wakefield
- VPI&SU



Source: State Corporation Commission, 2016  
 Created by: Division of Public Utility Regulation, 2016

Disclaimer: This is an approximation, please contact the Division of Public Utility Regulation for official electric territory maps.

## **Delivery Systems**

Title 56 of the Code of Virginia states that “all distributors shall have the obligation to connect any retail customer, including those using distributed generation, located within its service territory to those facilities of the distributor that are used for delivery of retail electric energy, subject to Commission rules and regulations and approved tariff provisions relating to connection of service.”<sup>38</sup> In addition, transmission and distribution in Virginia is regulated by the State Corporation Commission. The SCC has been required to establish and review interconnection standards to ensure transmission and distribution is done safely and with reliability, and not inconsistent with nationally recognized standards. In adopting standards, the Commission is also required to prevent barriers to new technology that is unduly burdensome and expensive.<sup>39</sup>

## **Transmission System**

Virginia’s transmission system is made up of high-voltage, high-capacity components. Dominion Energy, Appalachian Power, Delmarva Power, and Old Dominion Electric Cooperative own and maintain transmission and distribution facilities in Virginia.<sup>40</sup> Dominion Energy has about 6,500 miles of 69 kV and above of transmission lines located in Virginia, West Virginia, and North Carolina that serves 2.6 million customers.<sup>41</sup> Between 2013 through 2017, the Company has spent close to \$4.5 billion in upgrading or adding new transmission and distribution lines, substations and other facilities to meet growing electricity demand within its service territory and maintain reliability.<sup>42</sup> Dominion also owns one of the largest 500 kV systems in the PJM.<sup>43</sup>

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<sup>38</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 23 - Virginia Electric Utility Regulation Act: § 56-578. Nondiscriminatory access to transmission and distribution system," Justia Law, <https://law.justia.com/codes/virginia/2016/title-56/chapter-23/section-56-578/>.

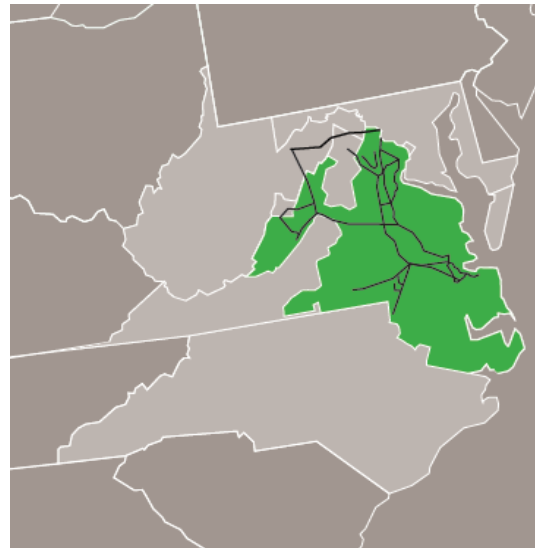
<sup>39</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 23 - Virginia Electric Utility Regulation Act: § 56-578. Nondiscriminatory access to transmission and distribution system," Justia Law, <https://law.justia.com/codes/virginia/2016/title-56/chapter-23/section-56-578/>.

<sup>40</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8-2, Transmission and Distribution of Electricity, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

<sup>41</sup> "Dominion's Operating and Service Areas," Dominion Resources, 2015, <https://dom.com/library/domcom/pdfs/investors/.../operating-and-service-areas.pdf>.

<sup>42</sup> "Virginia Offshore Wind Technology Advancement Project Final Technical Report," Dominion Annual Report Form 10-K, 2017, pg. 6, doi:10.2172/1341588.

<sup>43</sup> Nancy Muhl, "Project Proposal," Dominion Virginia Power, February 27, 2015, pg. 4, <http://www.pjm.com/-/media/planning/rtep-dev/expand-plan-process/ferc-order-1000/rtep-proposal-windows/redacted-public-proposals/201415-1-8a-dominion-transource-public-redacted-version-joshua-falls-palmyra-765kv.ashx?la=en>.



■ Regulated Electric Distribution (VA and NC)  
— Electric Transmission Lines (Bulk Delivery)  
**4 Dominion's Transmission Lines**

Appalachian Power Company's East Zone is comprised of nearly 15,000 miles of transmission circuitry operating at or above 138 kV, including 3,800 miles of 345 kV transmission lines, and over 2,100 miles of 765 kV transmission lines within the states of Indiana, Kentucky, Michigan, Ohio, Tennessee, Virginia, and West Virginia.<sup>44</sup> In Virginia, APCo has a transmission size of 2,634 miles, ranging from 69 kV to 765 kV lines, which provided 15,503,756 MWh in 2016<sup>45</sup> AEP is the only U.S. utility that currently engineers and designs 765 kV transmission facilities.<sup>46</sup>

Delmarva Power owns and the 138kV and 69 kV transmission lines near the border of Maryland and Virginia. Old Dominion Electric Cooperative owns approximately 110 miles of 69 kV lines on the Eastern Shore of Virginia in Accomack and Northampton counties. In addition, ODEC also co-owns 1,000 feet of 500 kV transmission line in Maryland.<sup>47</sup>

## Distribution System

<sup>44</sup> "Direct Testimony of Lisa Barton," Federal Energy Regulatory Commission, December 1, 2009, pg. 10-11, <https://www.aep.com/mwg-internal/de5fs23hu73ds/progress?id=ISkiiuju0tzCCMQdfCuZmBLisKiYwYhHjtbrZOL5uJ8>.

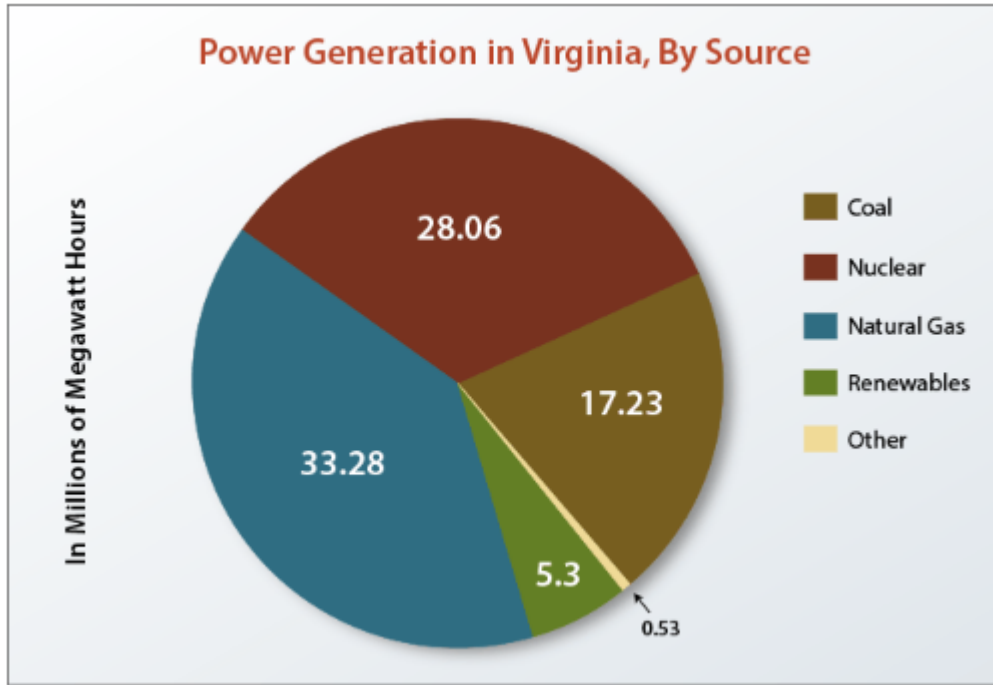
<sup>45</sup> "Appalachian Power Fact Sheet." Appalachian Power. June 2017. <https://www.appalachianpower.com/global/utilities/lib/docs/info/facts/factsheets/APCoOverallFactSheet6-17.pdf>.

<sup>46</sup> "Direct Testimony of Lisa Barton," Federal Energy Regulatory Commission, December 1, 2009, pg. 10-11, <https://www.aep.com/mwg-internal/de5fs23hu73ds/progress?id=ISkiiuju0tzCCMQdfCuZmBLisKiYwYhHjtbrZOL5uJ8>.

<sup>47</sup> "Generation and Transmission," Old Dominion Electric Cooperative: , <http://www.odec.com/generation-transmission/overview/>.

Dominion Energy has nearly 59,000 miles of distribution lines, 900 substations, 566,000 transformers and 1.1 million utility poles.<sup>48</sup> Appalachian Power Company owns 31,033 miles of distribution lines over 11,035 square miles of its operational service area, which serves approximately 522,577 customers.<sup>49</sup>

**Generation (in-state and out of state)**



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**Coal Generation**

Coal power provides roughly 17 percent of the state's total electricity needs. Dominion Energy currently owns six coal generating plants, with a total net generation capacity of 6,013 MWs, which provides electrical service to customers in Virginia.<sup>51</sup>

The Chesterfield Power Station, which is the largest in Dominion’s portfolio located within Virginia’s borders, supplies about 12 percent of the electricity used by its customers. With a net generating capacity is 1,640 MWs, Chesterfield Power Station has an average daily coal consumption of 8,400 tons. However, the station is not exclusively coal powered. Chesterfield 7 and 8 are combined cycle units - burning natural gas and distillate oil. Commercial Operation

<sup>48</sup> "Comparison of Transmission and Distribution Lines," Dominion Energy, <https://www.dominionenergy.com/about-us/moving-energy/comparison-of-transmission-and-distribution-lines>.

<sup>49</sup> "Appalachian Power Facts," Appalachian Power Company, <https://www.appalachianpower.com/info/facts/Facts.aspx>.

<sup>50</sup> "Energy," Virginia Performs, 2017, <http://vaperforms.virginia.gov/indicators/naturalResources/energy.php>.

<sup>51</sup> "Coal and Oil," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil>.

began in 1952 for Unit 3. Five additional Units have been added, with Unit 8 being most recently added in 1992.<sup>52</sup>

Mount Storm Power Station is the single largest coal-fired power station managed by Dominion Energy. Located in Grant County, West Virginia, Mount Storm has a net generating capacity of 1,629 MWs, consuming an average of 15,000 tons of coal and 700 tons of limestone a day.

Located in Yorktown, Virginia, Yorktown Power Station is Dominion's third largest coal-fired power plant with a net generating capacity of 1,141 MWs.<sup>53</sup> The station powers 285,000 homes, or a little over 6 percent of the Company's customers' electricity. However, Unit 3 is an oil fired, but is used only as a peaking unit. Units 1 and 2 have an average daily coal consumption of 2,200 tons. Unit 3, when operating, has an average daily oil consumption of 20,000 barrels.<sup>54</sup>

Clover Power Station has a net generating capacity of 865 MWs, and is located in Clover, VA. The station has an average daily coal consumption of 3,786 tons, which powers 285,000 homes. Commercial operation began in 1995 for Unit 1 and 1996 for Unit 2.<sup>55</sup>

Virginia City Hybrid Energy Center, located in St Paul, VA, has a net generating capacity of 600 MWs. With commercial operations beginning in July 2012, the station uses primarily coal, but also offers up to 20 percent biomass, about 537,000 tons/year, for its fuel.<sup>56</sup>

Mecklenburg Power Station, located in Clarksville, VA, is Dominion's smallest in Virginia's borders. With a net generating capacity of 138 MWs, this station powers 34,000 homes. Commercial operation began in 1992.<sup>57</sup>

Appalachian Power Company currently has three coal generation plants, all located in West Virginia, that provide some electricity to its Virginia customers. The John E. Amos plant, which is the company's largest in its fleet and also one of the largest in the country, is located in Winfield, WV. With a total of three units, the station has a net generation capacity of 2,900 MWs. All three units became operational between 1971, 1972, and 1973. The Mountaineer plant, which is based in New Haven, WV, has a net generating capacity of 1,300 MWs. The Mitchell Power Plant located in Moundsville, WV has a net generating capacity of 1,560 MWs. While the

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<sup>52</sup> "Coal and Oil: Chesterfield Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/chesterfield-power-station>

<sup>53</sup> "Coal and Oil: Yorktown Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/yorktown-power-station>.

<sup>54</sup> "Coal and Oil: Yorktown Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/yorktown-power-station>.

<sup>55</sup> "Coal and Oil: Clover Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/clover-power-station>.

<sup>56</sup> "Coal and Oil: Virginia City Hybrid," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/virginia-city-hybrid-energy-center>.

<sup>57</sup> "Coal and Oil: Mecklenburg Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/coal-oil/mecklenburg-power-station>.



Mitchell Power Plant is operated by Appalachian Power Company, it is owned by Kentucky Power and Wheeling Power.<sup>58</sup>

## Renewable Generation (Solar and Wind)

Virginia has seen a rapid expansion of its renewable energy market, particularly with solar energy development. In 2012, solar was non-existent in Virginia. Over the last few years, solar prices have declined significantly and some state policies have encouraged more adoption. As a result, in 2015, an estimated 25 to 30 MW were installed across residential, commercial, and utilities properties. However, in 2016, 192.4 MW were installed, primarily utility-scale projects to satisfy growing commercial needs. For example, in October 2016, the 80 MW Amazon-Dominion Solar Farm, which was the largest solar farm in the mid-Atlantic region at that time, went into service on Virginia's Eastern Shore.<sup>59</sup> For 2017, an estimated 241.5 MWs will be installed.<sup>60</sup> As of winter 2017, Dominion Energy has a total of 211 MWs installed. In May 2017, Governor McAuliffe reported that Virginia has a total of more than 1,800 MWs of solar installed or under development.<sup>61</sup> Dominion recently announced in its Integrated Resource Plan (IRP) to install more than 5.2 GWs of new solar by 2042.<sup>62</sup>

While Appalachian Power does not have solar installed at this time, several projects, including a 25 MW project, have been announced.<sup>63</sup> In addition, APCo announced in its IRP plans to install 20 MW annually starting in 2020. The company will ramp up solar deployment to 60 MWs beginning in 2026. By 2031, APCo is intending to have 525 MWs of solar deployed to meet demand needs. In addition to solar, the company will deploy 120 MWs of wind generation in 2018, 225 MWs in 2019, 300 MWs in 2020, and 300 MWs added each year for three years after. The company will add another 250 MWs of wind in 2023 and an additional 300 MWs by the end of the planning period, bringing total wind generation to 1,695 MW by 2031. In support of renewable generation, APCo will add 10 MWs of lithium-ion battery storage in 2025.<sup>64</sup>

There are currently no installed wind projects in the state, either land-based or off-shore. However, plans are moving forward for 25 wind turbines, totaling 75-to-80-megawatt, located in

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<sup>58</sup> "Appalachian Power Fact Sheet." Appalachian Power. June 2017.

<https://www.appalachianpower.com/global/utilities/lib/docs/info/facts/factsheets/APCoOverallFactSheet6-17.pdf>.

<sup>59</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural gas, <https://www.eia.gov/state/analysis.php?sid=VA>.

<sup>60</sup> "Virginia Solar." Solar Energy Industries Association. <https://www.seia.org/state-solar-policy/virginia-solar>.

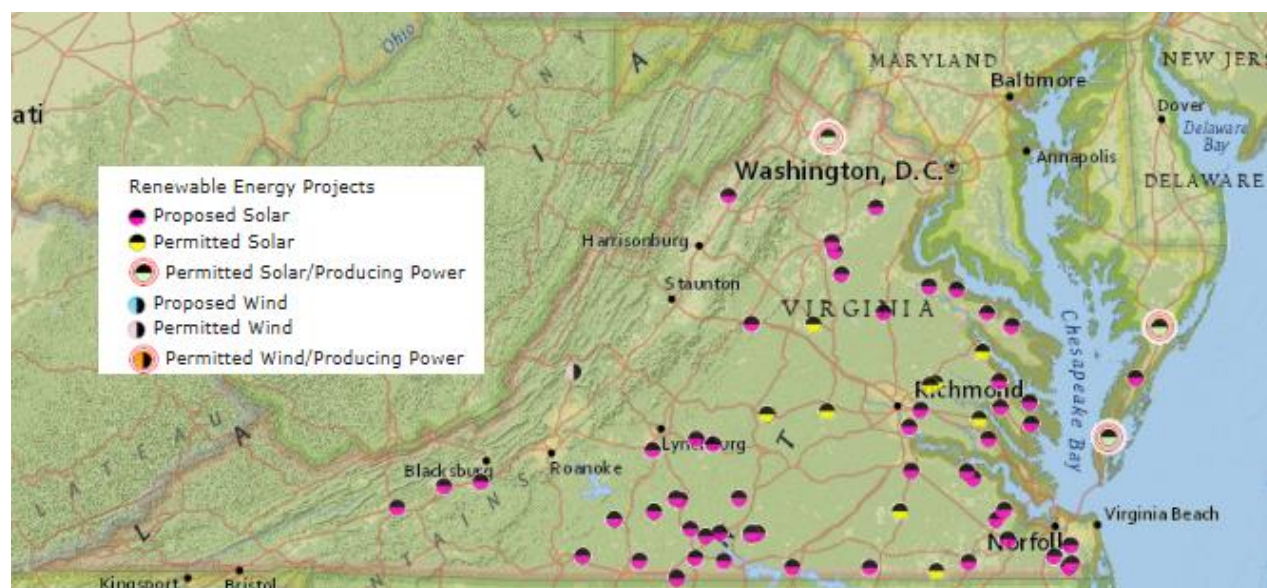
<sup>61</sup> Main, Ivy. "2017 guide to Virginia wind and solar policy." Sierra Club. June 30, 2017. Accessed December 27, 2017. <http://www.sierraclub.org/virginia/blog/2017/06/2017-guide-virginia-wind-and-solar-policy>.

<sup>62</sup> Robert Walton, "Dominion Virginia's long-term plan targets 5.2 GW of new solar by 2042," Utility Dive, May 5, 2017, <https://www.utilitydive.com/news/dominion-virginias-long-term-plan-targets-52-gw-of-new-solar-by-2042/442067/>

<sup>63</sup> "Appalachian Power Seeks New Utility-Scale Solar Projects," Appalachian Power, January 1, 2017, <https://www.appalachianpower.com/info/news/viewRelease.aspx?releaseID=2143>.

<sup>64</sup> "2017 Integrated Resource Plan," Appalachian Power Company, May 1, 2017, May 1, 2017, <https://www.dominionenergy.com/library/domcom/pdfs/corporate/2017-irp.pdf>.

a remote section of northern Botetourt County.<sup>65</sup> In addition, Dominion announced in July 2017 its plan to move ahead with two 6-megawatt turbines 27 miles off the coast of Virginia Beach.<sup>66</sup>



## Natural Gas Generation

Natural gas consumption in Virginia has risen sharply since 2003, increasing more than eight-fold by 2016, when the electric power sector accounted for almost three-fifths of the natural gas delivered to consumers in the state.<sup>68</sup> By 2016, the electric power sector consumed more natural gas than the other end-use sectors combined. The industrial sector is the second-largest natural gas-consuming sector in Virginia followed by the residential sector, where one in three households use natural gas for home heating.<sup>69</sup>

Dominion Energy is the largest provider of electricity utilizing natural gas. The Company currently owns sixteen generating plants that are either located in state or providing power to the state. The total net generation capacity of these plants is 9,829 MWs. Included in this generation is the Greenville County Power Station, which is currently being constructed in Greenville/Brunswick County, VA and will be the Company's largest natural gas facility at 1,588 MWs. Construction should be completed in 2018.<sup>70</sup>

<sup>65</sup> Chandler, Kevin, "Virginia's Rocky Forge Wind Farm Approved," Apex Clean Energy, March 2, 2017, <https://www.apexcleanenergy.com/news/virginias-rocky-forge-wind-farm-approved/>.

<sup>66</sup> Frangoul, Anmar, "Dominion Energy Virginia and Dong Energy move forward with offshore wind project," CNBC, July 11, 2017, <https://www.cnbc.com/2017/07/11/dominion-energy-and-dong-energy-offshore-wind-project.html>.

<sup>67</sup> "Virginia Environmental Geographic Information Systems." Virginia Department of Environmental Quality.

<sup>68</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural gas, <https://www.eia.gov/state/analysis.php?sid=VA>.

<sup>69</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Natural gas, <https://www.eia.gov/state/analysis.php?sid=VA>.

<sup>70</sup> "Natural Gas: Greenville Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/natural-gas/greenville-power-station>.

Dominion's second largest plant is the Brunswick County Power Station. Constructed in 2016 and located in Freeman, VA, the station has a net generating capacity of 1,358 MWs, which powers 340,000 homes. The station uses combined-cycle technology with 3 combustion turbines that generate 280 MWs each.<sup>71</sup>

Dominion's third largest, Warren County Power Station, is located in Front Royal, VA. At 1,329 MWs, the station has powered 330,000 homes since its construction in December 2014.

The last power station above 1000 MW is Fairless Power Station, which is located in Fairless Hills, PA. Constructed in 2004, the 1,180 MW plant is a combined-cycle power station that uses a selective catalytic reduction system to reduce nitrogen oxide emissions.<sup>72</sup>

Other natural gas power plants owned and operated by Dominion Energy include- Bear Garden Power Station (590 MW) located in Buckingham County, VA; Bellemeade Power Station (267 MW) located in Richmond, VA; Bridgeport Fuel Cell (14.9 MW) located in Bridgeport, CT; Darbytown Power Station (336 MW) located in Richmond, VA; Elizabeth River Power Station (348 MW) located in Chesapeake, VA; Gordonsville Power Station (218 MW) located in Gordonsville, VA; Gravel Neck Power Station (368 MW) located in Surry, VA; Ladysmith Power Station (783 MW) located in Ladysmith, VA; Manchester Street Power Station (450 MW) located in Providence, RI; Remington Power Station (608 MW) located in Remington, VA; and lastly Rosemary Power Station (165 MW) located in Roanoke Rapids, NC.<sup>73</sup>

Appalachian Power Company owns and operated three natural gas power plants that provide service to Virginia. At 484 MWs, Clinch River Power Station is APCo's only natural gas power station located within Virginia's borders. Located in Carbo, VA, Clinch station was once a 705 MW three unit coal plant. Clinch River Plant made power generation history in 1960 when it became the first power station ever to operate over a full calendar year at a heat rate below 9,000 Btu per kWh generated.<sup>74</sup> In order to comply with the U.S. EPA's Mercury and Air Toxics Standards, the station was retired in mid-2015 and was converted into a natural gas power plant.<sup>75</sup>

APCo's other two natural gas plants are Ceredo and Dresden. Ceredo Power Station is located in Ceredo, West Virginia. Operating at 523 MWs, the station was designed and built for Columbia Energy by AEP's Pro Serv subsidiary in 2001. However, in 2005, American Electric Power, through its Appalachian Power utility subsidiary, purchased the power station for

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<sup>71</sup> "Natural Gas: Brunswick County Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/natural-gas/brunswick-county-power-station>.

<sup>72</sup> "Natural Gas: Fairless Power Station," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/natural-gas/fairless-power-station>.

<sup>73</sup> "Natural Gas," Dominion Energy, <https://www.dominionenergy.com/about-us/making-energy/natural-gas>.

<sup>74</sup> "Clinch River Plant Facts," American Electric Power, <https://www.aep.com/environment/PlantRetirements/docs/ClinchRiver/NewClinchRiverFactSheet.pdf>.

<sup>75</sup> "Clinch River Plant Facts," American Electric Power, <https://www.aep.com/environment/PlantRetirements/docs/ClinchRiver/NewClinchRiverFactSheet.pdf>.

approximately \$100 million.<sup>76</sup> Dresden is a 580 MW combined-cycle generating unit located in Dresden, Ohio that began commercial operations in 2012.<sup>77</sup>

## **Nuclear Generation**

Nuclear generation supplies roughly 30 percent of Virginia's electricity needs.<sup>78</sup> The state's four nuclear reactors, with a total capacity of 3,568 MWs, are primarily owned and operated by Dominion Energy; however, ODEC does own a portion of one of the facilities. Reactors North Anna 1 (948 MWs) and North Anna 2 (944 MWs) are located in Mineral, Virginia, which is about 50 miles north-west of Richmond. Reactors Surry 1 (838 MWs) and Surry 2 (838 MWs) are located in Surry, Virginia, which is right outside Newport News. Surry powers about 420,000 homes in Virginia. The reactors at Surry were commissioned in 1972 and 1973, and currently have a license expiration date of 2032 and 2033.<sup>79</sup> However, in late 2015, Dominion Energy informed the US Nuclear Regulatory Commission (NRC) that it would apply for a second 20-year life extension for its Surry units.<sup>80</sup> The reactors at North Anna were commissioned in 1978 and 1980, and currently have a license expiration date of 2038 and 2040.<sup>81</sup>

In May 2017, Dominion announced that it was issued a combined operating and construction license by the NRC that would allow the Company to move forward with plans to develop a third nuclear reactor at the North Anna plant.<sup>82</sup> However, in September, Dominion announced that it would suspend development of the third reactor until further notice.<sup>83</sup> This is likely the result of planned constructions of nuclear reactors in other states being delayed.<sup>84</sup>

Appalachian Power Company and Kentucky Utilities Company do not currently own or operate any nuclear reactors within Virginia's borders.

## **Existing Policies (Laws/Regulations)**

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<sup>76</sup> McHenry, Melissa, "AEP completes purchase of Ceredo Generating Station," American Electric Power, December 15, 2005, <https://aep.com/newsroom/newsreleases/?id=1248>.

<sup>77</sup> Davis, Tama, "AEP Increases Natural Gas-Fired Generation Capacity As Newly Constructed Dresden Plant Goes On Line," American Electric Power, February 1, 2012, <https://www.aep.com/newsroom/newsreleases/default.aspx?id=1741>.

<sup>78</sup> "Energy," Virginia Performs, 2017, <http://vaperforms.virginia.gov/indicators/naturalResources/energy.php>.

<sup>79</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Nuclear, <https://www.eia.gov/nuclear/state/archive/2010/virginia/>.

<sup>80</sup> "Surry to seek 80-year operation," Nuclear Engineering International, March 30, 2016, <http://www.neimagazine.com/features/featuresurly-to-see-80-year-operation-4849335/>.

<sup>81</sup> U.S. Energy Information Administration, Virginia Profile Analysis, Updated 2017, Nuclear, <https://www.eia.gov/nuclear/state/archive/2010/virginia/>.

<sup>82</sup> Zullo, Robert, "Dominion Energy getting license for third reactor at North Anna," Richmond Times-Dispatch, May 31, 2017, [http://www.richmond.com/business/local/dominion-energy-getting-license-for-third-reactor-at-north-anna/article\\_5de453f8-7ce1-5aa9-ae4c-5e64a466981d.html](http://www.richmond.com/business/local/dominion-energy-getting-license-for-third-reactor-at-north-anna/article_5de453f8-7ce1-5aa9-ae4c-5e64a466981d.html).

<sup>83</sup> Maloney, Peter, "Dominion hits pause on North Anna nuclear plant development," Utility Dive, September 07, 2017, <http://www.utilitydive.com/news/dominion-hits-pause-on-north-anna-nuclear-plant-development/504389/>.

<sup>84</sup> Pierobon, Jim, "Amid nuclear setbacks, Virginia utility pauses plans for new reactor," Southeast Energy News, September 06, 2017, <http://southeastenergynews.com/2017/09/06/amid-nuclear-setbacks-virginia-utility-pauses-plans-for-new-reactor/>.

## Renewable Portfolio Standard

Virginia's Renewable Portfolio Standard (RPS) was established in 2007 as a voluntary goal. To encourage participation, the legislature permitted utilities to recover costs for RPS programs through rate adjustment clauses (RACs). In 2009, the legislature expanded the goal to encourage IOUs to acquire a percentage of the power sold in Virginia from eligible renewable energy sources.<sup>85</sup> The legislature allowed the SCC to offer utilities an increased rate of return for each RPS goal attained from qualified renewable energy generation facilities.<sup>86</sup> In 2012, the legislature permitted investor-owned utilities to meet up to 20 percent of a renewable energy goal through certificated research and development activity expenses related to renewable energy and alternative energy sources.

The legislature established the RPS goal as:

- RPS Goal I: 4 percent of base year sales in 2010;
- RPS Goal II: Average of 4 percent of base year sales in 2011 through 2015, and 7 percent of base year sales in 2016;
- RPS Goal III: Average of 7 percent of base year sales in 2017 through 2021, and 12 percent of base year sales in 2022;
- RPS Goal IV: Average of 12 percent of base year sales in 2023 and 2024, and 15 percent of base year sales in 2025.

Each IOU must report to the Commission annually by November 1 on its efforts, if any, to meet the RPS Goals, its overall generation of renewable energy, and any advances in renewable generation technology. Electricity must be generated in Virginia or in the interconnection region of the regional transmission entity.<sup>87</sup> Eligible energy resources include solar, wind, geothermal, hydropower, wave, tidal, and biomass energy. Onshore wind and solar power receive a double credit, and offshore wind receives triple credit toward RPS goals, and existing renewable energy generators are eligible for RPS compliance.<sup>88</sup>

Participating utilities may use Renewable Energy Credits to meet up to 20 percent of an annual requirement. All RECs acquired after January 1, 2014 will expire after five years if they are not applied to meet the RPS requirement.

## Net Energy Metering

Virginia's Net Metering program was first proposed in 1999 in the General Assembly. However, it was not until 2010 the SCC formally adopted regulations. In general, net metering is available to customers on a first-come, first served basis through investor-owned utilities

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<sup>85</sup> "Voluntary Renewable Energy Portfolio Goal," DSIRE, <http://programs.dsireusa.org/system/program/detail/2528>.

<sup>86</sup> "Voluntary Renewable Energy Portfolio Goal," DSIRE, <http://programs.dsireusa.org/system/program/detail/2528>.

<sup>87</sup> "Voluntary Renewable Energy Portfolio Goal," DSIRE, <http://programs.dsireusa.org/system/program/detail/2528>.

<sup>88</sup> "Voluntary Renewable Energy Portfolio Goal," DSIRE, <http://programs.dsireusa.org/system/program/detail/2528>.

(including competitive suppliers) and electric cooperatives, but not to customers of municipal utilities. It is first-come, first-served because utilities only have to provide net metering until the rated generating capacity owned and operated by customer-generators reaches 1 percent of an electric distribution company's adjusted Virginia peak-load forecast for the previous year.<sup>89</sup>

In order to qualify, residential customers may only generate electricity from renewable fuel sources that are up to 20 kW capacity, while non-residential customers are capped at 1,000 kW in capacity. In addition, generation systems must be located on the customer's property and must be sized to primarily offset the customer's electricity requirements. Prospective net metering customers must receive approval from their utility to interconnect prior to installation of the generation system.<sup>90</sup>

In 2011, the General Assembly passed legislation requiring residential facilities with an AC capacity of greater than 10 kW to pay a monthly standby charge. The legislation required electric suppliers to design this fee and seek approval through the SCC that the charge is reasonable and would allow the supplier to recover a portion of the infrastructure cost. Dominion received approval for its standby charge, which requires customers to pay \$2.79 per kW in monthly distribution standby charges and \$1.40 kW in monthly transmission standby charges. In addition, customers must also pay an inspection fee of \$50 for inverter based systems greater than 10 kW.<sup>91</sup>

In 2013, the General Assembly created net metering programs for agricultural customers of investor-owned utilities and electric cooperatives. Agricultural customers are allowed to aggregate their electric meters in a single account such that they are located at contiguous sites and served under an appropriate tariff. The aggregated generation capacity is limited to 500 kW for agricultural businesses.<sup>92</sup>

Customer-generators own all of the RECs their system generates. Virginia's net metering law states that at the time a customer enters into a power purchase agreement with the utility for net excess generation, the customer has a one-time option to sell RECs to the utility. This provision does not preclude the customer and utility (or other entity) from voluntarily entering into an agreement for the sale and purchase of RECs at any other time.<sup>93</sup>

## **Permit By Rule**

In 2009, the General Assembly directed the Department of Environmental Quality to develop a permit by rule (PBR) for the construction and operation of small renewable energy projects that have a maximum capacity of 100 MWs if they generate electricity from sunlight,

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<sup>89</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

<sup>90</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

<sup>91</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

<sup>92</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

<sup>93</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

wind, or falling water, wave motion, tides, or geothermal power, or 20 MWs if they generate electricity from biomass, energy from waste, or municipal solid waste.<sup>94</sup>

Since its implementation, permit by rule has had a positive impact on the development of solar in Virginia. Not only does PBR provide certainty, timeliness, and reasonable regulatory requirements, it also provides enforceable standards that are protective of wildlife and historic resources at or near project sites. This in turn provides an expedited permitting process for solar projects. This is accomplished by i) stating up front the regulation criteria that the applicant must meet; ii) requiring that the applicant to submit docs/certification that has met requirements; and iii) requiring DEQ to review submission for completeness and adherence to regulation. If complete, DEQ will notify that the project is authorized under the PBR.<sup>95</sup>

### **Integrated Resource Planning**

Under Virginia code § 56-599, each electric utility is required to file an integrated resource plan annually at the SCC. The code requires that each integrated resource plan considers options for maintaining and enhancing rate stability, energy independence, economic development (including retention and expansion of energy-intensive industries), and service reliability.

In addition, each electric utility must systematically evaluate, and propose i) entering into short-term and long-term electric power purchase contracts; ii) owning and operating electric power generation facilities; iii) building new generation facilities; iv) relying on purchases from the short term or spot markets; v) making investments in demand-side resources, including energy efficiency and demand-side management services; vi) taking such other actions, as the Commission may approve, to diversify its generation supply portfolio and ensure that the electric utility is able to implement an approved plan; vii) the methods by which the electric utility proposes to acquire the supply and demand resources identified in its proposed integrated resource plan; viii) the effect of current and pending state and federal environmental regulations upon the continued operation of existing electric generation facilities or options for construction of new electric generation facilities; and ix) the most cost effective means of complying with current and pending state and federal environmental regulations, including compliance options to minimize effects on customer rates of such regulations.<sup>96</sup>

The Commission analyzes and reviews the integrated resource plans and, after giving notice and opportunity to be heard, the Commission makes a determination as to whether an IRP is reasonable and is in the public interest.

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<sup>94</sup> Hogan, Clarke, "HB 2175 Small renewable energy projects; DEQ to develop procedure permitting construction and operation," Legislative Information System, January 14, 2009, <http://lis.virginia.gov/cgi-bin/legp604.exe?091%2Bsum%2BHB2175>.

<sup>95</sup> Wampler, Carol, "DEQ's Renewable Energy Permit by Rule: Background & Status," Department of Environmental Quality. July 20, 2010.

<sup>96</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 24 - Virginia Electric Utility Regulation Act: § 56-599. Integrated resource plan required.," Justia Law, <http://law.lis.virginia.gov/vacode/title56/chapter24/section56-599/>.

## Energy Efficiency

During the 2007 re-regulation of utilities, the General Assembly established a voluntary energy consumption reduction goal by including language that “the Commonwealth shall have the stated goal of reducing the consumption of electric energy by retail customers through the implementation of [demand-side management and energy efficiency] programs by the year 2022 by an amount equal to ten percent of the amount of electric consumed by retail customers in 2006.”<sup>97</sup>

Under this provision, the SCC was directed to conduct a proceeding to consider whether the ten percent goal could be met cost-effectively, determine the mix of programs that should be implemented and their cost, and develop a plan for development and implementation of these programs, including who should deploy and administer these programs.

In June, 2007, the SCC began a series of hearings under case number PUE-2007-00049 to determine the “recommended mix of programs, including demand side management (DSM), conservation, energy efficiency, load management, real-time pricing, and consumer education, to be implemented in the Commonwealth to cost-effectively achieve the energy policy goals set in § 67-102 of the Code of Virginia to reduce electric energy consumption.”<sup>98</sup> Almost one hundred organizations plus sixteen private citizens were divided into six workings groups to provide recommendations to the Commission. The SCC completed a report in late 2007 verifying the energy efficiency goal of ten percent by 2022 was achievable.<sup>99</sup>

In January of 2008, the SCC approved five conservation and energy efficiency pilot projects and four demand response/load management pilots proposed by Dominion (Case No. PUE-2007-00089).<sup>100</sup> Dominion is now in its sixth phase of energy efficiency programs, Phase I being PUE-2007-00089. Dominion has proposed many different types of residential and commercial programs in each of its six phases, including check-up and audit programs, heat-pump and HVAC upgrades and tune-ups, duct sealing, lighting upgrades, and distributed generation. However, while some of these programs have received Commission approval, many have not. In addition, the funding for those programs did not receive the entire funding requested, thus rollout has been challenging for the company.

The graph below shows the amount Dominion has requested for programs compared to the amount approved by the SCC. The difference is quite significant. For example, Dominion sought approval for its Phase VI programs in late 2016 to implement two new DSM programs, the Residential Home Energy Assessment Program and the Non-residential Prescriptive Program. In addition, Dominion sought to extend the Residential Heat Pump Upgrade program for two more years and the Non-residential DG Program for five years. Dominion originally proposed a five-year spending cap for the Phase VI programs in the amount of \$177,658,296,

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<sup>97</sup> “Implementation of the Virginia Electric Utility Regulation Act, 2007,” State Corporation Commission, September 9, 2007, pg.1 <https://www.scc.virginia.gov/comm/reports/restrct4.pdf>.

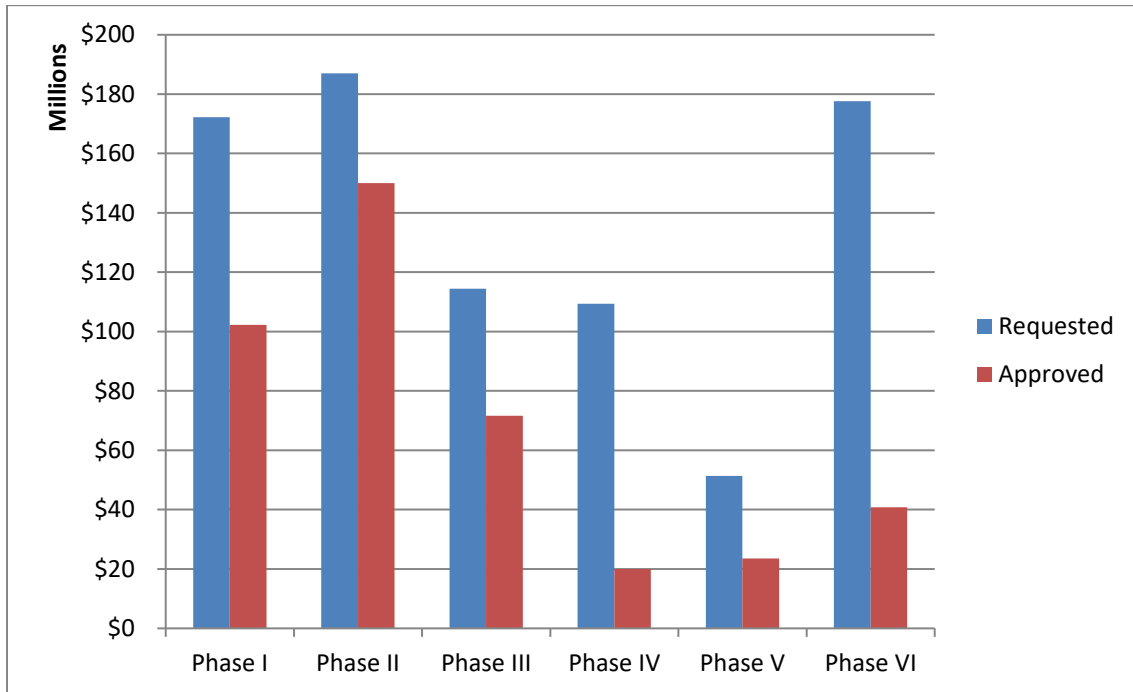
<sup>98</sup> “Implementation of the Virginia Electric Utility Regulation Act, 2007,” State Corporation Commission, September 9, 2007, pg.19 <https://www.scc.virginia.gov/comm/reports/restrct4.pdf>.

<sup>99</sup> “Implementation of the Virginia Electric Utility Regulation Act, 2007,” State Corporation Commission, September 9, 2007, pg.10 <https://www.scc.virginia.gov/comm/reports/restrct4.pdf>.

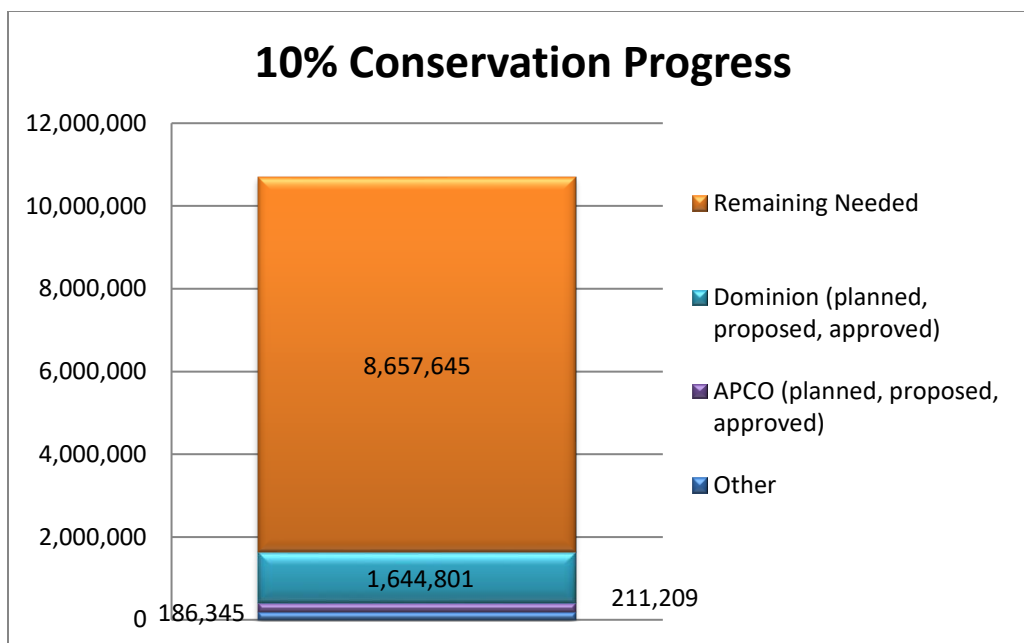
<sup>100</sup> “Energy Efficiency Resource Goal,” DSIRE, <http://programs.dsireusa.org/system/program/detail/5056>



and \$4,853,946 for the Non-residential DG Program. On June 1, 2017, the Commission only approved two programs at significantly reduced rates: the Non-residential Prescriptive Program with a total cost cap of \$36.0 million and the Non-residential DG Program for \$4,853,946.



The baseline for the goal, ten percent of the amount of electricity consumed by retail customers in 2006, is 10,700,000 MWh. Projected savings that can be documented to date total 1,644,801 MWh, or 15.37 percent of the goal. Projected savings include planned, proposed, and approved savings from Dominion and APCo; savings from the DMME-administered Energy Services Performance Contract (ESPC) program for state agencies and local governments; a 2012 appliance rebate program; Energy Star homes; Virginia SAVES; and estimated savings from Commercial PACE.



Due to the voluntary nature of the ten percent electricity savings goal and the Commission's reluctance to approve energy efficiency programs, Virginia is unlikely to achieve the goal by 2022.

## Challenges

### **Aging infrastructure (transmission/distribution)**

Aging transmission and distribution infrastructure is a growing challenge in Virginia. Currently, utilities must receive a certificate of public convenience and necessity (CPCN) from the SCC for any electric transmission construction or modifications.<sup>101</sup> To secure a CPCN, there must be a hearing, public comment, analysis of the environmental and economic impacts, and the utility must summarize its efforts to reasonably minimize adverse impact on the scenic assets, historic districts, and environment of the area concerned.<sup>102</sup> Despite the regulatory requirements, Dominion Energy and APCo have been making efforts in recent years to upgrade its aging transmission lines in areas that have seen significant population and economic growth. For example, AEP announced its plans to invest approximately \$9 billion in its transmission business over the next three years, more than half of the company's total capital investment forecast.<sup>103</sup> In 2015, Dominion announced plans to spend \$3 billion on transmission line projects through

<sup>101</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 1 - Virginia Electric Utility Regulation Act: § 56-46.1, Commission to consider environmental, economic and improvements in service reliability factors in approving construction of electrical utility facilities; approval required for construction of certain electrical transmission lines; notice and hearings.," Justia Law, <https://law.lis.virginia.gov/vacode/56-46.1/>.

<sup>102</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 1 - Virginia Electric Utility Regulation Act: § 56-46.1, Commission to consider environmental, economic and improvements in service reliability factors in approving construction of electrical utility facilities; approval required for construction of certain electrical transmission lines; notice and hearings.," Justia Law, <https://law.lis.virginia.gov/vacode/56-46.1/>.

<sup>103</sup> Knutson, Kent, "Top Players Will Continue to Spend Heavily on Transmission," Transmission & Distribution World, May 12, 2017, <http://www.tdworld.com/transmission/top-players-will-continue-spend-heavily-transmission>.

2020.<sup>104</sup> However, some of these projects have received opposition from the public and regulatory hurdles, stalling overall momentum in upgrades to aging transmission and distribution infrastructure.<sup>105</sup>

### **New transmission siting**

The General Assembly, the SCC, utilities, and citizens can have diverse views when it comes to the location of transmission lines. Currently, when a utility proposes a transmission route, the SCC is required to determine that a line's route will reasonably minimize adverse impact on the scenic assets, historic districts, and environment of the area.<sup>106</sup> However, there have been several proposals by citizens and legislators to expand transmission siting requirements. During the 2017 Legislative Session, a bill was introduced that would require the "SCC, prior to approving the construction of any electrical transmission lines of 138 kV or more, to determine that the corridor or route chosen for the line will avoid any adverse impact on the scenic assets, historic resources, and environment of the area concerned. If the SCC determines that no route or corridor exists that can avoid any such adverse impact, the SCC is directed to choose the corridor or route that minimizes such adverse impacts to the greatest extent reasonably practicable."<sup>107</sup> While the bill did not pass, continued efforts are being made to modify how transmission lines are planned and approved. A recent proposal suggests that future transmission line should be buried for a more resilience and reliable grid, while also addressing the concerns of the public who are impacted by transmission lines.

### **Resilience/reliability**

Grid resilience and reliability has always been an important issue among policy makers, energy officials, and utilities. Several programs are currently in place in Virginia to support a more reliable grid. For example, Virginia's voluntary demand response program allows utility accounts to be paid to reduce their electrical load when the electric grid is seeing high load, such as a hot summer day.<sup>108</sup> In addition, On June 16, 2017, the Department of Energy granted a request made by the PJM Interconnection to direct Dominion Energy to run two coal-fired units in Virginia on an as-needed basis in order to maintain grid reliability due to anticipated heightened electricity demand conditions associated with hot summer weather.<sup>109</sup>

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<sup>104</sup> Delony, Jennifer, "Dominion Virginia Power plans \$3bn in transmission line projects through 2020," Transmission Hub, 9 Feb. 2015, [www.transmissionhub.com/articles/2015/02/dominion-virginia-power-plans-3bn-in-transmission-line-projects-through-2020.html](http://www.transmissionhub.com/articles/2015/02/dominion-virginia-power-plans-3bn-in-transmission-line-projects-through-2020.html).

<sup>105</sup> French, Laura, "Business owners say their livelihoods are threatened due to new bridge restriction," WTVR, November 7, 2017, <http://wtvr.com/2017/11/07/robert-o-norris-bridge-investigation/>.

<sup>106</sup> Barber, Wayne, "Virginia transmission siting bill being continued until 2017," Hubs, July 6, 2016, <https://www.hubs.com/explore/2016/07/virginia-transmission-siting-bill-being-continued-until-2017>.

<sup>107</sup> Barber, Wayne, "Virginia transmission siting bill being continued until 2017," Hubs, July 6, 2016, <https://www.hubs.com/explore/2016/07/virginia-transmission-siting-bill-being-continued-until-2017>.

<sup>108</sup> Department of Mines, Minerals and Energy, Demand Response, <https://www.dmme.virginia.gov/DE/DemandResponseContract.shtml>.

<sup>109</sup> Ciampoli, Paul, "DOE OKs PJM request to keep Va. coal units available for reliability," American Public Power Association, June 26, 2017, <https://www.publicpower.org/periodical/article/doe-oks-pjm-request-keep-va-coal-units-available-reliability>.

In March 2017, the PJM Interconnection released its analysis that the grid “can remain reliable with the addition of more natural gas and renewable resources.”<sup>110</sup> Regardless, Virginia is still in need of improvements to its grid for more resilience and reliability. In December 2017, Karen Jackson, Secretary of Technology for the Commonwealth, emphasized to state elected officials the need to bolster the grid against cyber-security attacks.<sup>111</sup> Edison Electric Institute recently expressed its position on how grid modernization can speed up the restoration of electricity services during severe weather, such as hurricanes.<sup>112</sup>

More importantly, Dominion Energy recently expressed its interest in utilizing a reinvestment model into grid modernization with an emphasis on transforming “the grid to know immediately when your power is out or even about to go out, and where to deploy our crews to restore power. We can, with the right investments, come ever closer to our goal of power that is always on.”<sup>113</sup>

While it is unclear at this time what Dominion has planned, the Company reinforced its position in its IRP on the need to modernize its grid system, with the intention of including elements such as “i) smart or AMI meters; ii) improved communications network; iii) intelligent devices to monitor, predict and control the grid; iv) distribution substation automation; v) plans to replace aging infrastructure; vi) improvements to security; vii) methods to investigate new innovative technologies; and viii) an enhanced customer information platform to enable management of their energy usage.”<sup>114</sup>

APCo has also placed some emphasis on grid efficiency and reliability programs in its IRP as well. The Company hopes to create programs for both commercial/industrial and residential customers through new EE programs. By 2031, these programs could provide a decrease in residential and commercial energy usage of nearly seven percent. APCo will be also seeking Volt/VAR Optimization, which would result in a cumulative capacity reduction of 17 MWs by 2031. All of these programs combined will reduce energy requirements by 850GWh annually and summer capacity requirements by 203 MWs by 2031.<sup>115</sup>

## **Existing generation**

Despite the diverse existing energy generation in Virginia, utilities do not own enough in-state generation capacity sufficient to meet their territories’ peak loads plus the reserves required

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<sup>110</sup> "PJM Study: system reliable even with much more gas, renewables; resilience key to operational reliability." PJM. March 30, 2017. <https://www.pjm.com/-/media/about-pjm/newsroom/2017-releases/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx>.

<sup>111</sup> Bacon, James, "Dominion Open to Ending Rate Freeze," Bacon's Rebellion, December 05, 2017, <http://baconsrebellion.com/41442-2/>.

<sup>112</sup> Bacon, James, "Dominion Open to Ending Rate Freeze," Bacon's Rebellion, December 05, 2017, <http://baconsrebellion.com/41442-2/>.

<sup>113</sup> Bacon, James, "Dominion Open to Ending Rate Freeze," Bacon's Rebellion, December 05, 2017, <http://baconsrebellion.com/41442-2/>.

<sup>114</sup> "Virginia Electric and Power Company’s Report of Its Integrated Resource Plan," Dominion Energy, May 1, 2017, pg. 85, <https://www.dominionenergy.com/library/domcom/pdfs/corporate/2017-irp.pdf>.

<sup>115</sup> "2017 Integrated Resource Plan," Appalachian Power Company, May 1, 2017, May 1, 2017, <https://www.dominionenergy.com/library/domcom/pdfs/corporate/2017-irp.pdf>.

by the FERC.<sup>116</sup> For example, in 2010, 35.9 percent of the electricity consumed was purchased on the wholesale market pursuant to existing contracts. Up to 45 percent of Virginia's electric supply comes from power generated out-of-state. Most imports come from the west and north of Virginia. A small amount of imports come from renewable projects such as wind projects in West Virginia, Illinois, and Indiana.<sup>117</sup>

### **New generation siting**

Title 56 of the Code of Virginia empowers the SCC to regulate the construction of new generation.<sup>118</sup> The Commission must give full consideration of the environmental, economic, and service reliability impacts of new generation prior to issuing any permits for construction.<sup>119</sup> These requirements have an impact on the siting of new generation. While utilities are offered some flexibility on providing economic reliability impacts, the Department of Environmental Quality is responsible for determining the impact on the environment.

If the location receives approval from the local government, the utility must apply for all applicable permits from DEQ. Depending on the size and type of the plant, this could include permits for air, water and/or waste. Air impacts undergo a very rigorous review that can take a year or more to review. The review includes the determination of the Best Available Control Technology for each criteria pollutant being emitted and may require a determination of the Maximum Achievable Control Technology for Hazardous Air Pollutants.<sup>120</sup>

In addition to control technology reviews, DEQ conducts air quality analyses. This involves running multiple computer models to demonstrate the plant will not cause or significantly contribute to an exceedance of any of the National Ambient Air Quality Standards. For most power plants, the air permit process involves multiple opportunities for public comment. Comment is usually taken either in written form or orally at a public hearing. Comments received from the public are taken into consideration prior to a permit being issued.<sup>121</sup>

Recently, siting for solar generation has faced some challenges in Virginia. The primary issue solar has faced is how the infrastructure fits into local government taxation and land-use permits. For example, if a company wishes to build a solar farm on land that has been assessed under agricultural use, the land will need to be changed to commercial or industrial through a conditional use permit. In localities that value agriculture, the local government may be reluctant to issue such a permit, especially if it is for 30 years or more. In addition, the General Assembly

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<sup>116</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

<sup>117</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 8, Energy Infrastructure, [https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan).

<sup>118</sup> <https://law.lis.virginia.gov/vacode/title56/chapter10.1/section56-265.2/>

<sup>119</sup> "2016 Code of Virginia: Title 56 - Public Service Companies: Chapter 1 - Virginia Electric Utility Regulation Act: § 56-46.1, Commission to consider environmental, economic and improvements in service reliability factors in approving construction of electrical utility facilities; approval required for construction of certain electrical transmission lines; notice and hearings.," Justia Law, <https://law.lis.virginia.gov/vacode/56-46.1/>.

<sup>120</sup> "Power Plants in Virginia," Virginia Department of Environmental Quality, <http://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Permitting/PowerPlants.aspx>.

<sup>121</sup> "Power Plants in Virginia," Virginia Department of Environmental Quality, <http://www.deq.virginia.gov/Programs/Air/PermittingCompliance/Permitting/PowerPlants.aspx>.

has recently made changes to exemptions and machine and tool taxes on solar equipment, which is a source of revenue for local governments.

## **Trends**

### **Load growth**

Virginia consumed over 2,430 trillion BTUs of energy in 2014, indicating that energy use has begun to stabilize upward after a general, decade-long decline in energy consumption.<sup>122</sup> According to PJM, Dominion and APCo are projected to experience 0.4 percent annual growth rate over 10 years.<sup>123</sup>

### **Demand for more renewables (distributed and utility-scale)**

In 2011, the General Assembly passed a law allowing Dominion to build up to 30 MWs of solar energy on leased property, such as roof space on a college or commercial establishment.<sup>124</sup> The pilot project was intended to help Dominion learn about grid integration. The SCC approved \$80 million of spending, to be partially offset by selling the RECs. The pilot program resulted in several commercial-scale projects on university campuses and corporate buildings. However, the pilot project has since fizzled out.<sup>125</sup> In addition, distributed generation solar for individual consumers continues to be a weak spot in Virginia

During the 2017 Legislative Session, the General Assembly passed legislation that required Dominion and Appalachian Power to develop community solar pilot programs for their retail customers. The community solar projects must i) exclusively use solar; ii) be placed in service on or after July 1, 2017; iii) not be constructed by the utility, but acquired through a purchase agreement from a third party; and iv) sized no larger than 2 MW per project. The pilot program has a duration of three years. Appalachian Power must have program between 0.5 MW and 10 MW, while Dominion's program must be between 10 MW and 40 MW. The program design and the voluntary rate schedule for participants in the community solar programs will be approved by the Commission.<sup>126</sup>

### **Pollution Mitigation**

On October 25, 2016, the United States District Court approved a partial settlement and consent decree resolving allegations that Volkswagen (VW) violated the Clean Air Act by the sale of approximately 500,000 model year 2009 to 2015 motor vehicles containing 2.0 liter diesel engines equipped with emissions testing defect devices in the form of computer software designed to cheat on federal emissions tests. Additionally, on December 20, 2016, the court and

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<sup>122</sup> Energy, " Virginia Performs, 2017, <http://vaperforms.virginia.gov/indicators/naturalResources/energy.php>.

<sup>123</sup> "PJM Load Forecast Report, January 2017," PJM, January 2017, <https://www.pjm.com/~media/library/reports-notices/load-forecast/2017-load-forecast-report.ashx>.

<sup>124</sup> Main, Ivy, "2017 guide to Virginia wind and solar policy," Sierra Club, June 30, 2017, <http://www.sierraclub.org/virginia/blog/2017/06/2017-guide-virginia-wind-and-solar-policy>.

<sup>125</sup> Main, Ivy. "2017 guide to Virginia wind and solar policy." Sierra Club. June 30, 2017. Accessed December 27, 2017. <http://www.sierraclub.org/virginia/blog/2017/06/2017-guide-virginia-wind-and-solar-policy>.

<sup>126</sup> "Net Metering," DSIRE, <http://programs.dsireusa.org/system/program/detail/40>.

VW reached an agreement regarding the installation and use of emission testing defect devices in approximately 80,000 model year 2009 to 2016 motor vehicles containing 3.0 liter diesel engines sold and operated in the U.S.<sup>127</sup>

To mitigate environmental damages from violating the Clean Air Act, the settlement requires VW to invest \$2.925 billion in an independently administered environmental trust, which will fund projects to fully mitigate the diesel emissions caused by the offending vehicles. States, tribes, Puerto Rico, and the District of Columbia have been allocated a portion of the trust based on the number of affected vehicles in their jurisdiction. Virginia anticipates receiving \$93.6 million from the Trust between 2017 and 2027.<sup>128</sup>

## **Electrification of transportation system**

Utilities and policy makers recognize the need to expand the state's network of electric charging stations to accommodate the growing rate of electric vehicles, which is expected to represent 15 percent of the vehicles on the road by 2027.<sup>129</sup> On July 26, 2017, Governor McAuliffe announced that 319 state and local government vehicles have been transitioned to alternative fuel, such as a blend of renewable ethanol fuel and electric.<sup>130</sup> In addition, Governor McAuliffe recently announced a \$14 million Request for Proposal to deploy an interconnected and statewide public electric vehicle charging network.<sup>131</sup> In order to develop a robust network of electric vehicle charging stations along the most-traveled portions of the state, Virginia will designate 15 percent of the \$93.6 million as part of the Volkswagen settlement.<sup>132</sup>

## **Emerging Technologies**

### **Energy Storage**

Virginia houses the largest pumped hydroelectric storage facility in the world, which acts as battery storage for Dominion Energy. The six unit Bath County Pumped Storage Station is rated at 3,003 MWs and supplements the Company's base-load coal, nuclear and gas-fired plants with its variable output. When energy demand peaks, the Bath County facility drains water from an upper reservoir through tunnels to its hydroelectric turbines more than 1,000 feet below. When demand is low, Dominion pumps water in the lower reservoir back up the mountain, in

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<sup>127</sup> "Volkswagen Settlement Agreements," Virginia Department of Environmental Quality, <http://www.deq.virginia.gov/Programs/Air/VWMitigation.aspx>.

<sup>128</sup> "Volkswagen Settlement Agreements," Virginia Department of Environmental Quality, <http://www.deq.virginia.gov/Programs/Air/VWMitigation.aspx>.

<sup>129</sup> Clabaugh, Jeff, "Virginia seeks to expand network of electric vehicle charging stations," WTOP, October 9, 2017, <https://wtop.com/business-finance/2017/10/virginia-expand-network-electric-vehicle-charging-stations/>.

<sup>130</sup> "Governor McAuliffe Announces Transitioning Government Vehicles to Alternative Fuels." NBC29. July 26, 2017. <http://www.nbc29.com/story/35978482/governor-mcauliffe-announces-transitioning-government-vehicles-to-alternative-fuels>.

<sup>131</sup> "Governor McAuliffe Announces RFP to Deploy \$14 Million for Electric Vehicle Charging Infrastructure in Virginia," Governor Terry McAuliffe, <https://governor.virginia.gov/newsroom/newsarticle?articleId=21438>.

<sup>132</sup> "Governor McAuliffe Announces RFP to Deploy \$14 Million for Electric Vehicle Charging Infrastructure in Virginia," Governor Terry McAuliffe, <https://governor.virginia.gov/newsroom/newsarticle?articleId=21438>.

effect recharging its battery.<sup>133</sup> Dominion Energy is conducting in-depth studies of two potential sites for another pumped storage hydropower facility in southwest Virginia. In addition, Appalachian Power Company owns a 586 MW pumped hydroelectric storage facility near Rocky Mount, VA.<sup>134</sup>

At this time, battery storage technology outside of pumped storage has been restricted to pilot or testing programs. In 2015, Dominion installed a zinc-iron flow and an aqueous hybrid ion battery at a rooftop solar facility located at Randolph Macon College. These two small batteries are designed to test the extended capabilities of these new devices, and prove the potential benefits when integrated with existing solar generation.<sup>135</sup> In an effort to understand and expand battery storage technology in Virginia, the legislature passed a bill authorizing the expansion of the state's Solar Energy Development Authority to include energy storage.<sup>136</sup> The purpose of the new Solar Energy and Battery Storage Development Authority is to position the state as a leader in research, development, commercialization, manufacturing, and deployment of energy storage technology.<sup>137</sup>

### **Advanced Metering Infrastructure**

Like battery storage technology, Advanced Metering Infrastructure (AMI) rollout has been slow. However, with the growing interest on grid reliability and resilience, so has the pursuit into AMI technology. In 2009, Dominion Energy began a rollout of AMI technology to 7,000 customers in Chesterfield County and 48,000 customers in Charlottesville.<sup>138</sup> This digital meter provided 2-way communications using cellular data modem with 900 MHz radio. The meter could also provide remote meter reading, daily meter reading (kWh), demand (kW), voltage, report outages and power restoration, easily connect/disconnect account, and more frequent readings for special pricing.<sup>139</sup> While the Company wanted to expand this program, it received skepticism from the SCC due to the economics, and eventually froze the program. In addition, in 2013, several legislators expressed concerns over privacy issues related to AMI, and attempted to prohibit the rollout of any future AMI by utilities.<sup>140</sup>

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<sup>133</sup> Bacon, James, "Dominion's 3,000-Megawatt Battery," Bacon's Rebellion, October 18, 2017, <http://baconsrebellion.com/dominions-3000-megawatt-battery/>.

<sup>134</sup> "Appalachian Power in Virginia Fact Sheet," Appalachian Power. October 2017, <https://www.appalachianpower.com/global/utilities/lib/docs/info/facts/factsheets/APCoVaFactSheet10-17.pdf>.

<sup>135</sup> IRP page 94

<sup>136</sup> "New Virginia Law Expands Solar Energy Development Authority to Include Energy Storage," Renewable Energy World, May 09, 2017, <http://www.renewableenergyworld.com/articles/2017/05/new-virginia-law-expands-solar-energy-development-authority-to-include-energy-storage.html>.

<sup>137</sup> "New Virginia Law Expands Solar Energy Development Authority to Include Energy Storage," Renewable Energy World, May 09, 2017, <http://www.renewableenergyworld.com/articles/2017/05/new-virginia-law-expands-solar-energy-development-authority-to-include-energy-storage.html>.

<sup>138</sup> Bacqué, Peter, "Dominion Virginia Power wants more testing for smart meters," Richmond Times-Dispatch, February 02, 2010, [http://www.richmond.com/business/dominion-virginia-power-wants-more-testing-for-smart-meters/article\\_45d16404-f265-53a8-af1b-f983815654a6.html](http://www.richmond.com/business/dominion-virginia-power-wants-more-testing-for-smart-meters/article_45d16404-f265-53a8-af1b-f983815654a6.html).

<sup>139</sup> "Smart Meters: Protecting Customer Privacy," Dominion Energy, <https://www.dominionenergy.com/library/domcom/.../smart-meters/smart-meter.pdf?>

<sup>140</sup> Garrett, Thomas, "SB 797 Electric utilities; advanced meters," Legislative Information System, December 19, 2012, <https://lis.virginia.gov/cgi-bin/legp604.exe?131+sum+SB797>.



While that proposal failed, both Dominion and Appalachian Power continue to express interest in smart grids and AMI technology. In July 2017, APCo announced plans to install 54,000 AMI meters in the Christiansburg, Blacksburg, Lynchburg and Lovingston areas. This technology includes cellphone technology that transmits meter readings directly to the company, eliminating the need for an employee to drive by the residence.<sup>141</sup> In addition, the Christiansburg/Blacksburg and Lynchburg/Lovingston areas experience a high number of connects and disconnects due to student housing moves. The new meters will allow connects and disconnects to be accomplished remotely, speeding service to customers. The new meters will also allow APCo to more quickly detect when an outage occurs; thus, can more quickly dispatch a crew to the site to restore power.<sup>142</sup>

## **Governor McAuliffe's Energy Policy Accomplishments**

Terry R. McAuliffe was elected Governor of Virginia on November 5, 2013, and was sworn in on January 11, 2014. A governor may only serve a single, four-year term. Governor McAuliffe's term will expire on January 13, 2018.

### **Executive Orders and Directives**

#### **Executive Order 16**

On May 27, 2014, Governor McAuliffe signed Executive Order 16, which created the Virginia Energy Council (VEC). This advisory group, comprised of 20-25 members representing all areas of the Commonwealth's energy industry, was tasked with formulating a comprehensive and innovative state energy plan that focused on accelerating the development and use of renewable energy sources, increasing energy productivity through greater efficiency, promoting a diverse energy mix, and growing jobs in the energy sector (See Appendix X for Executive Order 16). The Secretary of Commerce and Trade chaired the Council and delivered final recommendations for the Virginia Energy Plan, which was submitted to the General Assembly on October 1, 2014. One of the final recommendations from this group of subject matter experts was to accelerate the timeline to achieve the codified ten percent reduction goal by two years, from 2022 to 2020.<sup>143</sup>

#### **2014 Virginia Energy Plan Recommendations**

As a result of Executive Order 16, the Virginia Energy Council submitted its recommendations to the Governor, which were then incorporated into the 2014 Virginia Energy Plan. These goals included strategic growth in the energy sector, expansion of best-in-class infrastructure, advancement of technology and alternative fuel, and talent development in the energy sector.

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<sup>141</sup> "Appalachian Power to upgrade meters in some Virginia communities," Appalachian Power Company, July 24, 2017, <https://www.appalachianpower.com/info/news/viewRelease.aspx?releaseID=2285>.

<sup>142</sup> "Appalachian Power to upgrade meters in some Virginia communities," Appalachian Power Company, July 24, 2017, <https://www.appalachianpower.com/info/news/viewRelease.aspx?releaseID=2285>.

<sup>143</sup> McAuliffe, Terry, "Executive Order 16," May 27, 2014, <https://governor.virginia.gov/media/3344/eo-16-establishing-the-virignia-energy-councilada.pdf>.

For strategic growth in the energy sector, it was recommended in the plan that i) the development of renewable energy sources be accelerated in the Commonwealth to ensure a diverse fuel mix and promote long-term economic health; ii) make Virginia a leader in energy efficiency by reducing consumption and spur economic growth; iii) to go global with coal technology; iv) to pursue the development of Virginia's offshore gas and oil resources.<sup>144</sup>

In order to meet best-in-class infrastructure, it was recommended in the 2014 Virginia Energy Plan to i) expand, improve, and increase the reliability of Virginia's energy infrastructure, and; ii) accelerate the development of advanced vehicle technology and the use of alternative fuels for vehicles in the Commonwealth.<sup>145</sup> Talent development would be accomplished through expanding and fostering an educational environment to prepare the next generation of Virginia's energy workforce.<sup>146</sup>

The recommendations in the 2014 Virginia Energy Plan triggered several additional Executive Orders by the Governor.

### **Executive Order 19**

On July 1, 2014, Governor McAuliffe signed Executive Order 19, which formally re-convened the Governor's Climate Change and Resiliency Update Commission. This commission was originally formed in 2008 under then Governor Tim Kaine and was called the Governor's Commission on Climate Change. Its focus was on the impacts of climate change on Virginia coastal areas. The 2008 Commission's final report outlined the impact that changing weather conditions have on Virginia's built environment, natural systems, and the health of its citizens. Among the findings was the decline or disappearance of key species of the Chesapeake Bay, increased damage from more frequent and severe storms, and the spread of vector born diseases like West Nile virus. The report also made over 150 recommendations to help Virginia adapt to the consequences of climate change, as well as reduce Virginia's contributions to the problem.<sup>147</sup>

Governor McAuliffe's Executive Order 19 re-convened the Governor's Climate Change and Resiliency Update Commission to review, update, and prioritize the recommendations of the 2008 Climate Change Action Plan. In addition, the Commission was to work to identify sources of revenue to fund the implementation of its recommendations. Members were appointed by the Governor and chaired by the Secretaries of Natural Resources and Public Safety and Homeland Security. The report and final recommendations were delivered on December 21, 2015. The

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<sup>144</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 12-1, Recommendations,

[https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan/18Recommendations.pdf](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/18Recommendations.pdf).

<sup>145</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 12-7, Recommendations,

[https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan/18Recommendations.pdf](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/18Recommendations.pdf).

<sup>146</sup> Department of Mines, Minerals and Energy, 2014 Virginia Energy Plan, October 1, 2014, Section 12-10, Recommendations,

[https://www.dmme.virginia.gov/DE/LinkDocuments/2014\\_VirginiaEnergyPlan/18Recommendations.pdf](https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/18Recommendations.pdf).

<sup>147</sup> McAuliffe, Terry, "Executive Order 19," July 1, 2014, <https://governor.virginia.gov/media/3348/eo-19-convening-the-governors-climate-change-and-resiliency-update-commissionada.pdf>.

Governor's Climate Change and Resiliency Update Commission's top five recommendations were 1) Establish a Climate Change and Resilience Resource Center and/or Clearinghouse; 2) Create a New Virginia Bank for Energy and Resilience; 3) Set a Renewable Energy Procurement Target for Commonwealth Agencies; 4) Adopt a Zero Emission Vehicle Program; and 5) Leverage Federal Funding to Make Coastal Communities, Southside, and Southwest Models of Resilience.<sup>148</sup>

### **Executive Order 31**

On October 16, 2014, Governor McAuliffe signed Executive Order 31, which instructs all executive branch agencies, authorities, departments, and all institutions of higher education to proactively pursue energy efficiency measures, especially energy performance contracting, to reduce energy consumption. The Governor set the goal of reducing electricity consumption in state facilities by 15 percent by 2017, or approximately 156 million kWh, using 2009-2010 as a baseline. In order to accomplish this goal, the Governor appointed the Advisor for Infrastructure and Development as the Commonwealth's Chief Energy Efficiency Officer (CEEEO) to oversee planning, implementation, and measurement of energy efficiency throughout state government.<sup>149</sup>

### **Executive Order 57**

On June, 28, 2017, Governor McAuliffe signed Executive Order 57, which directed the Virginia Secretary of Natural Resources to convene a workgroup and recommend concrete steps to reduce carbon pollution from Virginia's power plants. The convened workgroup received input from a diverse range of perspectives including scientists, energy experts, business leaders, and environmental advocates. The Secretary of Natural Resources was charged with developing a regulatory strategy to reducing carbon pollution in Virginia's energy sector while realizing opportunities to lead in the new clean energy economy.<sup>150</sup>

In preparing their recommendations, the Secretary and the work group had to consider 1) the establishment of regulations for the reduction of carbon pollution from existing electric power generation facilities pursuant to existing authority under Virginia Code; 2) the carbon reduction requirements for existing electric power generation facilities established under the federal Clean Air Act; 3) the interaction between electric utilities and regional markets, including PJM Interconnection; 4) the impact any reduction requirements place on the reliability of the electric system; 5) the impact any reduction of carbon pollution may have on electric rates and electric bills; 6) the impact of reducing carbon pollution on low income and vulnerable communities; 7) the cost effectiveness of pollution reduction technologies that may be deployed; 8) the economic development opportunities associated with deployment of new carbon reduction technologies; 9) the implementation and administration of carbon reduction regulations; and 10)

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<sup>148</sup> McAuliffe, Terry, "Executive Order 19," July 1, 2014, <https://governor.virginia.gov/media/3348/eo-19-convening-the-governors-climate-change-and-resiliency-update-commissionada.pdf>.

<sup>149</sup> McAuliffe, Terry, "Executive Order 31," October 16, 2014, <https://governor.virginia.gov/media/3257/eo-31-conserving-energy-and-reducing-consumption-in-the-commonwealth-of-virginiaada.pdf>.

<sup>150</sup> McAuliffe, Terry, "Executive Order 57," June 28, 2016, <https://governor.virginia.gov/media/6396/eo-57-development-of-carbon-reduction-strategies-for-electric-power-generation-facilities.pdf>.

flexibility in achieving the goals of any carbon reduction regulation.<sup>151</sup> The Secretary of Natural Resources was required to provide a report on the recommendations to the Governor by May 31, 2017. As a result of that report, Governor McAuliffe signed Executive Directive 11.<sup>152</sup>

## **Executive Directive 11**

As a result of Executive Order 57, Governor McAuliffe signed Executive Directive 11 on May 16, 2017. This directs the Director of the Department of Environmental Quality, in coordination with the Secretary of Natural Resources, to develop a proposed regulation for the State Air Pollution Control Board's consideration to abate, control, or limit carbon dioxide emissions from electric power facilities that 1) includes provisions to ensure that Virginia's regulation is "trading-ready" to allow for the use of market-based mechanisms and the trading of carbon dioxide allowances through a multi-state trading program; and 2) establishes abatement mechanisms providing for a corresponding level of stringency to limits on carbon dioxide emissions imposed in other states with such limits.<sup>153</sup> This regulation must be proposed to the State Air Pollution Control Board for consideration for approval for public comment by no later than December 31, 2017.

## **Governor-Elect Ralph Northam Goals**

On Tuesday, November 7<sup>th</sup>, 2017, Lt. Gov. Ralph Northam, a Democrat, won the election for governor of Virginia. Since his election, Governor-Elect Northam has announced several policy goals for his administration. These include, i) maintaining Virginia's commitment to reducing carbon emissions; ii) promoting competition and energy choice while facilitating decentralized generation; iii) utilizing existing funding to build electric and clean vehicle infrastructure and support programs to decrease vehicle emissions; iv) directing the Secretary of Natural Resources, Secretary of Health and Human Resources, and the Attorney General to form an environmental justice task force to address environmental threats in vulnerable communities, particularly in the areas of urban air quality, energy infrastructure siting, and drinking water, and; v) creating a "Conservation Cabinet" led by the Secretary of Natural Resources that will ensure coordination across all agencies that can bring resources to bear to address environmental issues, including encouraging the use of clean energy, utilizing energy efficiency, and ensuring environmental best practices are standard across the entirety of state government.<sup>154</sup> Northam's swearing in ceremony and inaugural ball will be held on Saturday, January 13, 2018.

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<sup>151</sup> McAuliffe, Terry, "Executive Order 57," June 28, 2016, <https://governor.virginia.gov/media/6396/eo-57-development-of-carbon-reduction-strategies-for-electric-power-generation-facilities.pdf>.

<sup>152</sup> McAuliffe, Terry, "Executive Directive 11," May 16, 2017, <https://governor.virginia.gov/media/9155/ed-11-reducing-carbon-dioxide-emissions-from-electric-power-facilities-and-growing-virginias-clean-energy-economy.pdf>.

<sup>153</sup> McAuliffe, Terry, "Executive Directive 11," May 16, 2017, <https://governor.virginia.gov/media/9155/ed-11-reducing-carbon-dioxide-emissions-from-electric-power-facilities-and-growing-virginias-clean-energy-economy.pdf>.

<sup>154</sup> "Environmental Policy," Ralph Northam, March 24, 2017, <https://ralphnortham.com/2017/03/24/environmental-policy/>.

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