Virginia Solar Energy Development and Energy Storage Authority

2019 Annual Report

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I. Introduction

This 2019 Annual Report of the Virginia Solar Energy and Energy Storage Authority ("2019 Annual Report") describes recent developments affecting solar energy and energy storage in Virginia. Virginia is now starting to keep up with national trends in these areas. Significant developments include the Commonwealth of Virginia Energy Storage Final Study ("2019 Commonwealth Energy Storage Study") and the Governor's Executive Order 43. The Executive Summary from the 2019 Commonwealth Energy Storage Study is included as **Appendix E** with this 2019 Annual Report, and the entire study is being filed separately in conjunction with this 2019 Annual Report.

II. Mission and Objectives

In 2015, the Virginia General Assembly created the Virginia Solar Energy Development Authority (the Authority) for the purposes of facilitating, coordinating, and supporting the development, either by the Authority or by other qualified entities, of the solar energy industry and solar energy projects. The Authority seeks to accomplish this by developing programs that increase the availability of financing for solar energy projects; facilitating the increase of solar energy generation systems on public and private sector facilities in the Commonwealth; promoting the growth of the Virginia solar industry; and providing a hub for collaboration between entities, both public and private, to partner on solar energy projects. The enabling legislation for the Authority is included in **Appendix A**.

The Authority, as originally created, was composed of 11 non-legislative citizen members: six members appointed by the Governor, three members by the Speaker of the House of Delegates, and two members by the Senate Committee on Rules.

In the 2017 legislative session, Code § 67-1500, et seq., was amended to include energy storage as a key activity for the Authority to study, and the Authority was renamed the *Virginia Solar Energy Development and Energy Storage Authority*. The legislation expanded the purposes of the authority to include positioning the Commonwealth as a leader in research, development, commercialization, manufacturing, and deployment of energy storage technology. The powers of the Authority were expanded to include (i) promoting collaborative efforts among Virginia's public and private institutions of higher education in research, development, and commercialization efforts related to energy storage; (ii) monitoring relevant developments nationally and globally; and (iii) identifying and working with the Commonwealth's industries and nonprofit partners. Four additional members were added: 2 appointed by the Governor and 1 each from the House and Senate. A listing of the appointed Authority members is included in **Appendix B.**

III. 2019 Status of Solar Energy in the United States and in Virginia

According to Wood Mackenzie and the Solar Energy Industries Association[1]:

- In Q2 2019, the U.S. solar market installed 2.1 GW_{dc} of solar PV, representing a 7% decline from Q2 2018.
- U.S. utilities have announced 11.2 gigawatts of new projects in just the first half of 2019, for a total of 37.9 gigawatts under development.
- Residential solar grew 8% year-over-year, increasing by over 600 MW for the fourth quarter in a row
- Woods Mackenzie forecasts total U.S. PV capacity will more than double over the next five years, with annual installations of nearly 18 MW in 2021 before the expiration of the federal Investment Tax Credit.

In Virginia, solar energy deployment and projects in various stages of development grew significantly from the 2018. The Commonwealth is currently ranked 18th in terms of solar deployment, rising one point from its ranking of 19th in 2018. While Virginia remains in the middle of the pack in terms of installed capacity, the expectation for significant growth in the near future is strong.

Utility solar increased significantly in 2019 and is by far the greatest source for increased solar capacity. Dominion Energy, Appalachian Power and the electric cooperatives all have made new commitments to increased solar generation.

Distributed (net metered) solar at homes and businesses grew by 30.4 MW to a total 80.1 MW and 8,862 distributed systems, an increase of 62% over the same time the previous year.

On September 16, 2019, Governor Northam signed Executive Order 43, which lays out Virginia's objectives for statewide energy production. These include the goal that by 2030, 30 percent of Virginia's electric system will be powered by renewable energy resources and by 2050, 100 percent of Virginia's electricity will be produced from carbon-free sources such as wind, solar and nuclear. The path forward includes ensuring that at least 3,000 megawatts of solar and onshore wind are under development by 2022, and that up to 2,500 megawatts of offshore wind are fully developed on an accelerated timeline by 2026.

The Executive Order also establishes lead-by-example targets for increasing energy efficiency and sets forth a goal of procuring at least 30 percent of the electricity consumed by the Commonwealth's agencies and executive branch institutions from renewable resources by 2022.

The Order directs the Department of Mines, Minerals and Energy (DMME), in consultation with the Secretary of Commerce and Trade, the Secretary of Natural Resources, and the Director of

[1] https://www.seia.org/research-resources/solar-market-insight-report-2019-q3

the Department of Environmental Quality, to develop a plan of action to meet these renewable energy goals. The plan will also address issues related to energy storage, energy efficiency, equity, and environmental justice.

300 kilowatt solar installation at the Virginia Public Safety Training Center in Hanover County is one of several solar projects installed at Commonwealth facilities as part of Governor Northam's Lead-by-Example initiative

On October 18, 2019 Governor Northam announced the state had negotiated an amendment to the state's bulk power purchase contract with Dominion Energy to buy renewable energy to power state government. This contract will ensure that by 2022, 30 percent of the electricity consumed by state agencies and institutions in Virginia comes from renewable sources, meeting the goal the Governor set forth in Executive Order 43. The agreement with Dominion Energy includes 345 MW of solar energy and another 75 MW of wind energy (420 MW total) from Apex Clean Energy's Rocky Forge Wind Farm in Botetourt County, which will be the first wind farm in Virginia.

The following sections represent a status update of solar energy and energy storage deployment at the time of this report.

Solar energy development in Virginia falls into four broad categories:

- **Distributed Solar**: the generation facilities are located, and the energy is largely consumed, on the retail customer's premises.
- **Utility-administered Community Solar:** the generation facility is located in the respective utility service territory and is owned by third-party solar developers or acquired by the utility via asset purchase with the generated electricity purchased by participating retail customers via general customer subscriptions.
- **Large Customer Solar Arrangements**: the generation facility is owned by the utility or a third-party and the energy and/or the renewable attributes are purchased via bilateral contract.
- **Utility Solar**: the solar generation is included as part of a utility's overall generation mix.

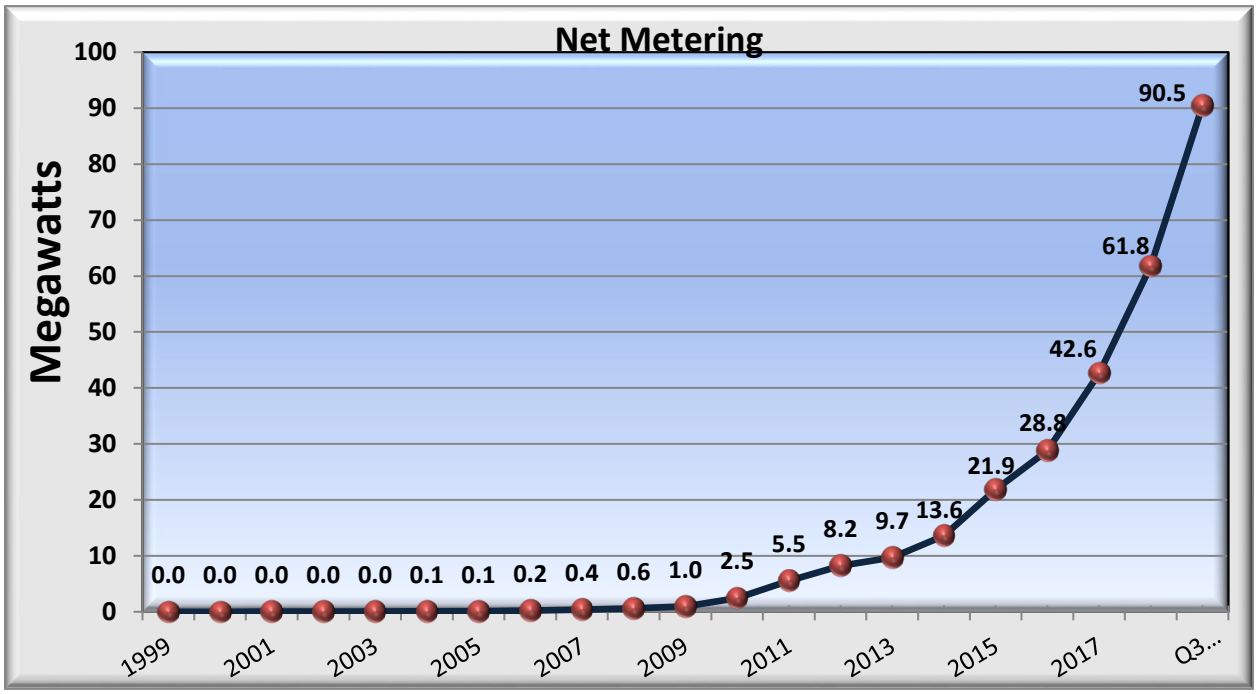
A. Distributed Solar Generation

Distributed generation, which generally includes systems acquired and owned by individuals and businesses with energy produced and consumed at the point of generation, as well as small systems deployed under third-party ownership agreements, continued to increase steadily.

All electric customers in Virginia may own solar generation facilities located on their premises that generate energy solely for consumption by that customer. Due to the barrier imposed by the up-front capital costs imposed by this model, there are several options under Virginia law to help customers finance these up-front capital costs: net metering, retail customer purchased power agreements, and retail customer self-generation agreements.

1. Net Metering

Net metering, which is implemented pursuant to Va. Code Section 56-594, involves utility purchases of excess power produced by renewable generation facilities located on an eligible customer's premises and sized to meet the needs of the customer. The number of net metered solar installations increased from approximately 6,486 installations totaling 55.8 megawatts at the time of the 2018 Annual Report to 9,949 installations totaling 90.5 megawatts through the end of September 2019. The chart below illustrates the considerable growth in net metering facilities in recent years in Virginia.



Growth in Net Metered Solar Generation

In 2019, the Virginia General Assembly made several changes to the existing net metering law as it applies to Virginia's electric cooperatives.

House Bill 2547 establishes requirements for net metering by electric cooperatives effective July 1, 2019, or on the date of implementing regulations by the State Corporation Commission ("SCC"), whichever comes first. The bill includes several requirements that differ from existing law, including (i) changing the cap on the capacity of generating facilities from one percent to

two percent of system peak for residential customers and not-for-profit customers as well as customers whose rates are not subject to the jurisdiction of the SCC ("nonjurisdictional customers") such as local, state, and federal governments; (ii) authorizing electric cooperatives to raise these caps up to a cumulative total of seven percent of its system peak; (iii) legalizing third-party power purchase agreements for those retail customers and tax-exempt nonjurisdictional customers; and (iv) establishing registration requirements for third-party power purchase agreements, including a self-certification system under which a provider is required to affirm certain information to the SCC, under penalty of revocation of its registration. The bill authorizes electric cooperatives to adjust their rates, terms, conditions, and rate schedules governing net energy metering without approval from the SCC. It also prohibits a cooperative after the date of such an adjustment from collecting stand-by charges, but instead allows them to adopt demand charges based upon a net metering customer's noncoincident peak demand. HB 2547 also authorizes Dominion Energy to petition the SCC to make their community solar pilot program permanent (and also Appalachian Power were they to develop a similar pilot), and requires Dominion Energy to (a) convene a stakeholder process, using an independent facilitator, to make recommendations to the utility concerning issues related to customer offerings facilitated by advanced metering technology, the provision of on-site distributed renewable generation to multifamily dwellings, and related system effects and requirements arising from distributed generation resources; (b) submit to the Commission retail rate schedules designed to offer time-varying pricing; and (c) submit to the Commission an incentive program for the installation of solar equipment for customers served under time-varying retail rate schedules that have advanced-metering technology equipment.

Cooperative	Cumulative Total	1% Cap	% of Cap Filled
A&N	0.507 MW	1.67 MW	30%
BARC	0.530078 MW	0.530078 MW	100%
Central Virginia	2.257527 MW	2.589544206 MW	87%
Community	0.142284 MW	0.65484 MW	22%
Craig-Botetourt	0.22656 MW	0.27821 MW	81%
Mecklenburg	0.676423 MW	1.394 MW	49%
Northern Neck	0.40578 MW	0.9449 MW	43%
NOVEC	3.907 MW	11.5 MW	33%
Prince George	0.11839 MW	0.75 MW	16%
Rappahannock	7.824 MW	11.71 MW	67%
Shenandoah Valley	5.458 MW	5.458 MW	100%
Southside	1.44285 MW	3.21357 MW	45%

Cooperative Utility Net Metered Solar Versus 1% Cap

In 2018 and 2019, the General Assembly addressed pilot programs for school net metering and for municipal net metering. House Bill 1451 from the 2018 General Assembly session addressed schools that generated electricity at levels that exceed the school's consumption. Senate Bill 1779 from the 2019 General Assembly session addressed municipal net metering.

In addition to the pilot programs described above, House Bill 2192 and Senate Bill 1331 from the 2019 General Assembly session provide for the modernization of public school buildings and the use of solar. The bills state that it is the legislative intent that public school buildings and facilities be designed, constructed, maintained, and operated to generate more electricity than consumed. They allow local school boards to enter into leases with private entities to achieve that goal if the school board owns or operates a school building or facility that has been properly modernized, generates energy derived from sunlight, and if the solar generating facility is properly interconnected. The bill also provides that private entities that contract with local school boards to modernize public school buildings and facilities may receive financing from the Virginia Small Business Financing Authority.

2. Retail Customer Power Purchase Agreements

Retail customer power purchase agreements, which are commonly known as PPAs, allow electric ratepayers to have solar energy at their facility without the need to purchase and maintain the solar generating equipment. Instead, the customer signs a long-term contract to purchase the output from a system that a third-party developer installs, owns and maintains on the customer's premises. Typical PPAs may result in a net savings or net cost over what the customer would normally pay their utility over the life of the PPA agreement, depending on the pricing structure of the PPA and any changes in utility rates over the life of the agreement.

Huguenot High School in Richmond is one of eleven Richmond Public Schools to install solar by entering into a Power Purchase Agreement with Staunton-based Secure Futures.

As discussed above, House Bill 2547 addresses PPAs for electric cooperative customers. In addition, PPAs are expressly permitted under a pilot program in the service territories of Dominion Energy and Appalachian Power under parameters set forth in Chapter 803 of the Acts of Assembly of 2017, an uncodified enactment. The pilot limits projects to no smaller than 50 kW, with an exception for tax-exempt entities in accordance with § 501(c) of the Internal Revenue Code, and no larger than one megawatt (1 MW). The aggregated capacity of all third-party renewable generating facilities participating in the pilot program in Dominion Energy territory is capped at 50 MW. The aggregated capacity for participation in the pilot program in Appalachian Power service territory is capped at 7 MW and is limited to nonprofit, private institutions of higher education as defined in § 23.1-100 of the Code of Virginia.

According to the SCC's Operational Capacity Management Summary, less than 10 MW remains before the 50 MW cap for the PPA Pilot Program in Dominion Energy's service territory is fully subscribed, while none has been subscribed in the Appalachian Power service territory.[2] The SCC Summary cites 40,469.174 kW of Noticed Pilot Program Generation Capacity with the Remaining Pilot Program Capacity being 9,530.826 kW for Dominion pilot PPAs. The SCC Summary states "[w]hen the Staff has received and posted Notices of Intent equaling . . . 50 MW in the case of DEV . . ., the Staff will treat these pilot programs as fully subscribed" and "[n]o further Notices of Intent will be accepted or posted by the Staff for a pilot utility on the Commission's website once its pilot program is thus fully subscribed."

3. Retail Customer Self-Generation Agreements

Solar self-generation agreements are an alternative method of financing developed by Staunton-based Secure Futures that allow third-party financing for solar generation.

According to Secure Futures' website, the Solar Self-Generation Agreement allows customers to go solar with no initial investment requirements and to self-generate their own electricity. Secure Futures finances the project, owns and installs the system, and guarantees its performance based on equipment specifications.

B. Utility-Administered Community Solar

1. Investor Owned Utility Solar Subscription Programs

Senate Bill 1393 approved in the 2017 General Assembly session requires Dominion Energy and Appalachian Power to conduct what has been characterized as "community solar" pilot programs administered by the utilities in which their retail customers voluntarily subscribe to

[2] http://scc.virginia.gov/pur/ppa/dev_capmgmt.pdf

purchase output from a project owned by a third-party solar developer or acquired by the utility via asset purchase. It should be noted that these programs are administered by utilities whereas some community solar models involve administration by a third-party entity. This utility model should not be confused with the more widely recognized community model in which the solar facilities are owned and operated by communities. Under the pilot program, participating customers purchase the solar energy by subscribing to a voluntary companion rate schedule. Eligible generation facilities include solar facilities that (i) exclusively use energy derived from sunlight; (ii) were placed in service on or after July 1, 2017; (iii) are not constructed by the utility but are acquired by the utility through an asset purchase agreement or subject to a power purchase agreement under which the utility purchases the facility's output from a third party; and (iv) have a generating capacity not exceeding two megawatts each, subject to an exception. The pilot programs will have three-year durations unless renewed or made permanent by appropriate legislation. The measure requires the investor-owned utilities to select eligible generating facilities through an RFP process. The minimum aggregate generating capacity of the eligible generating facilities in Appalachian Power's pilot program is 0.5 MW and in Dominion Energy's pilot program is 10 MW. The maximum aggregate generating capacity of the eligible generating facilities in Appalachian Power's pilot program is 10 MW and in Dominion's pilot program it is 40 MW. Appalachian Power's community solar pilot programs are still in the development phase. Dominion Energy's community solar pilot program was approved on September 11, 2018 and is currently open for pre-enrollment on the company website.[3] Consistent with the requirements of Senate Bill 1393, Dominion Energy collaborated with relevant governmental, non-profit, and for-profit entities to solicit input concerning options for the Pilot Program that would facilitate low-income customers' participation, while adhering to the requirement that Pilot Program costs are not recoverable from non-participants. Dominion Energy's RFP seeking solar generation facilities to serve the Pilot Program included "Virginia Economic Development/Low-Income Benefits" and "Community Access" as two of the evaluation criteria and gave consideration to any projects that would provide benefits to economically distressed areas in the Commonwealth or facilitate participation by, or access or benefits to, low-income customers.

Dominion Energy's residential and commercial customers under 500 kW will have the option to subscribe to the program at an amount that matches up to 100% of their monthly electricity use. Non-residential customers over 500 KW are limited to ten blocks (1,000 kWh). The additional cost of the program for customers, at least initially, will be 2.01 cents per kilowatt-hour. A typical customer using 1,000 kWh per month who wants to subscribe to the 100% option would pay approximately $20 extra per month.

[3] https://www.dominionenergy.com/home-and-small-business/renewable-energy-programs/community-solar

2. Electric Cooperative Solar Subscription Programs

Senate Bill 1393 from 2017 General Assembly session also allows for, but does not require, electric co-ops to conduct similar customer subscription pilot programs and gives them flexibility in designing their program and voluntary companion rate schedules.

In July 2018, the SCC approved three-year community solar pilot programs for four distribution co-ops served by the Old Dominion Electric Cooperative ("ODEC"). These include A&N, Mecklenburg, Northern Neck and Rappahannock Electric co-ops. Applications by two other distribution cooperatives also served by ODEC — Shenandoah Valley and Southside — are pending before the SCC.

After Hecate Energy developed a 10 MW solar facility located in White Post in Clarke County and the 20 MW Cherrydale solar facility located in Eastville in Northampton County, an affiliate of Dominion Energy acquired both projects. ODEC then entered into a long-term power purchase agreement for both projects and will be the sole off-taker of the electricity from these facilities. ODEC will resell the solar generation to its member distribution co-op who in turn sell the retail power in 50 kWh blocks to retail customers who are members of the distribution co-op allowing them to cover a portion or all of their electricity usage without the expense of owning and maintaining their own solar energy systems.

Northern Virginia Electric Cooperative announced in February 2019 that they signed a PPA with D.E. Shaw Renewable Investments ("DESRI") to purchase 300 MW of solar energy from facilities that DESRI will construct within the Dominion Energy and PJM footprint. Sites are being identified across Virginia and possibly adjacent states (e.g. West Virginia and North Carolina). Final siting of projects will likely occur in 2021.

Central Virginia Electric Cooperative, who is not an ODEC member, is buying the output from the Palmer Solar Center and the Martin Solar Center - two 5 MW solar facilities Fluvanna County - under a 25-year power purchase agreement with Coronal Energy.

Five Megawatt Martin Solar Center in Troy, Virginia

C. Solar Generation Dedicated to Large Customers

Dominion Energy's solar development in Virginia includes a mix of projects developed by both its regulated utility and its unregulated or merchant generation development business. Dominion Energy currently has approximately 476 MW of large-scale solar projects in operation as of October of 2019, with approximately 1,130 MW under development, including solar capacity under long-term purchase contracts. A large portion of this solar development is being driven by demand from owners of large data centers or other institutional customers such as the Commonwealth of Virginia who have set specific renewable energy goals. These are often described as "ring-fenced" models in which any additional costs associated with the solar generation is assigned to one or more specific customers that have entered into contracts with Dominion Energy regarding particular solar generation projects.

1. Energy and Renewable Attributes Dedicated to Specific Large Customers

One model utilized by Dominion Energy involves sales of energy and renewable attributes from a particular facility being split between different customers. An example of this approach is the 20 MW Remington project in Fauquier County, where Dominion Energy partnered with Microsoft and the Commonwealth of Virginia. Pursuant to this arrangement, the Commonwealth purchases the energy produced for use by state government facilities while Microsoft purchases the renewable attributes associated with the energy. Another model involves a single customer purchasing both the energy and renewable energy attributes from a particular facility. An example of this approach is the 18 MW solar energy facility at Naval Air Station Oceana in Virginia Beach, where Dominion Energy partnered with the Commonwealth of Virginia to purchase both the energy and the renewable attributes. In exchange for hosting the solar facility, the Navy will receive an alternative electrical feed, which will increase resiliency on the base.

Eighty Megawatt Amazon Solar Farm US East in Accomack County, Virginia

2. Renewable Attributes Dedicated to Specific Large Customers

A second model utilized by Dominion Energy allows eligible customers to promote the development of new renewable energy facilities by enhancing their cost effectiveness for all customers in exchange for the environmental attributes of up to 100% of the facility. Eligible non-residential customers may participate in this offering by subscribing to a voluntary companion rate schedule called Schedule RF.[4] Facebook has committed to subscribing to Schedule RF to meet its renewable energy goals connected to its proposed data center complex in Henrico County. Pursuant to this approach, Facebook purchases the renewable attributes from the facility while the energy is assigned to Dominion Energy's overall customer load. The SCC has approved construction of two solar facilities totaling 240 MW currently under development, which will provide environmental attributes to Facebook under Schedule RF. The two projects, Colonial Trail West (142 MW) and Spring Grove 1 (98 MW), are under development in Surry County and will become operational in late 2019 and late 2020 respectively.

D. Utility Solar

1. Rooftop Solar

Dominion Energy has installed approximately 7.2 MWs of distributed solar across 10 projects located on property owned by non-residential customers through its *Solar Partnership Program.*[5] The electricity from these 10 facilities is used to serve regulated electric customers in

800 kilowatt solar installation at Western Branch High School in Chesapeake, Virginia
Installed as part of Dominion Energy's Solar Partnership Program

Dominion Energy's Virginia and North Carolina electric service territories. Under the *Solar Partnership Program*, Dominion Energy is authorized to construct and operate up to 30 MWs of

[4] https://www.dominionenergy.com/library/domcom/media/home-and-small-business/rates-and-regulation/residential-business-rates-shared/virginia/schedule-rf.pdf?la=en&modified=20180601150242
[5] https://www.dominionenergy.com/large-business/renewable-energy-programs/solar-partnership-program

company-owned solar facilities on leased rooftops or on the grounds of commercial businesses and public properties throughout their service area.

2. Large Scale Solar

Dominion Energy has 18 solar facilities currently operational in Virginia totaling 476 MWs in their service area. Of these:

- **Six facilities (260 MW)** are dedicated to providing renewable energy to Amazon Web Services;
- **Four facilities (76 MW)**[6] serve Dominion Energy regulated electric customers in Virginia and North Carolina;
- **Three facilities (50 MW)** are helping meet the renewable energy goals of the Commonwealth (32 MW to UVA and 18 MW to all other Commonwealth agencies);
- **Two facilities (40 MW)** are dedicated to providing renewable energy to Facebook;
- **Two facilities (30 MW)** provide renewable energy for Old Dominion Electric Cooperative's members co-ops; and
- **The 20 MW Remington solar facility** provide commodity electricity to the Commonwealth, while the environmental attributes help Microsoft meet their renewable energy goals.

As of late October 2019, Dominion Energy has more than twenty additional solar facilities under development in Virginia totaling approximately 1,130 MW, including 345 MW across four projects in partnership with the Commonwealth of Virginia. See **Appendix D** for a full listing of Dominion Energy's large-scale solar projects both operational and under development.

Appalachian Power issued a Request for Proposals for up to 200 MW of solar. As of this report, the company is still in negotiations with a possible winning bidder. Appalachian Power will also contract with Coronal Energy to purchase the output from the 15 MW Depot Solar project in Campbell County. The project will be owned and operated by Coronal Energy.

In addition to the considerable activity by investor owned-utilities and by electric cooperative utilities, two municipal utilities have completed multi-megawatt solar projects.

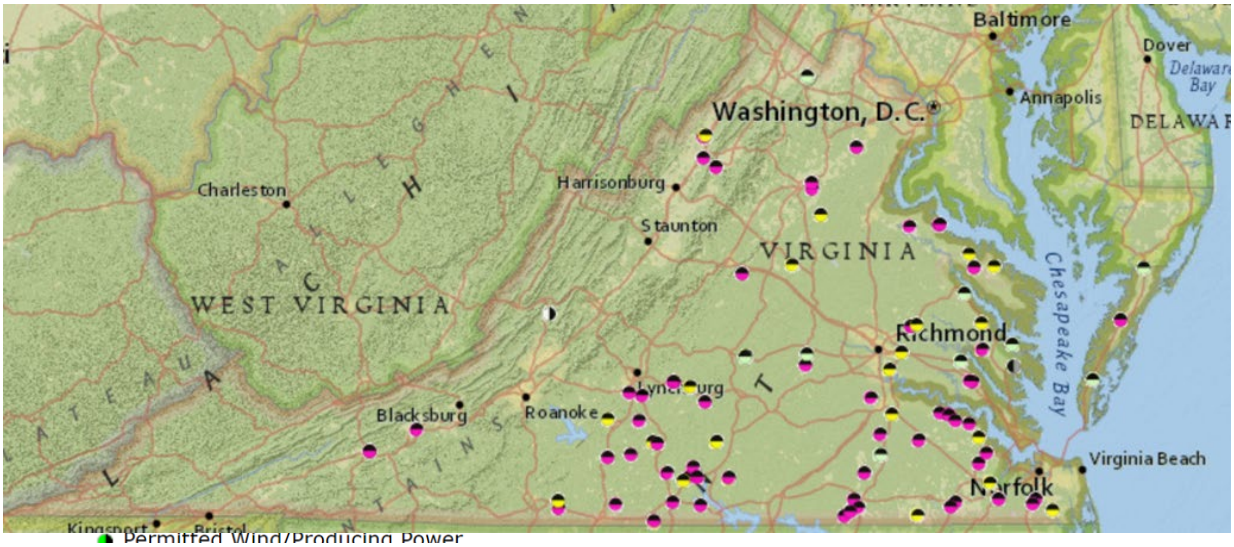
[6] Includes Essex Solar Facility (20 MW) in Essex County, Virginia not owned by Dominion Energy but under power purchase contract with the company.

The Town of Bedford contracted with North Carolina-based O2 emc to construct, own and operate a 3 MW installation adjacent to a closed land fill to supplement their municipal customers' electricity. The project was completed in December 2017, and the Town of Bedford is purchasing the electrical output from O2 emc under a long-term Power Purchase Agreement.

The City of Danville had the ribbon cutting for the six MW Kentuck Solar project in May of 2018. The City of Danville Department of Utilities is purchasing the energy from project owner WGL Energy at an agreed upon rate for 25 years. Danville Utilities expects to save money over the life of the project because the solar will reduce transmission congestion charges the city currently pays.

E. Projects Permitted under the Permit by Rule Process

Typically, electric generation construction projects must be approved by the Virginia State Corporation Commission. In order to streamline the process for smaller scale renewable generation projects, Virginia Code § 56-580 D and Virginia Code § 10.1-1197.6 created the **Permit by Rule** ("PBR") process, which was developed and is overseen by the Virginia Department of Environmental Quality (DEQ).



Solar and One Wind Power Permit by Rule Projects

The solar PBR became effective in 2012. To date 36 projects totaling 1,272 MW have been issued permits under the Permit by Rule program. In addition to the permitted projects, Notices of Intent to apply for permits have been submitted to DEQ by developers for 62 additional projects totaling 3,534 MW.

In 2017, legislation was passed to increase the size of projects eligible for a PBR from 100 MW to 150 MW. To address this change, as well as to address "lessons learned" through actual solar

facility installations since 2012, DEQ has convened a Regulatory Advisory Panel (RAP) to review the current regulations for the program and to make changes as necessary.

As of this writing, the RAP has convened three meetings to discuss issues such as:

- Program Fees
- Compliance & enforcement
- Notice of Intent
- Public process
- Phased construction for large projects
- And other issues necessary to improve permitting procedures and streamline the regulations while still protecting natural resources and human health.

A detailed list of planned and completed solar projects that have submitted Notices of Intent to apply for a permit and who have been permitted is included in **Appendix C**.

Solar and other generators at transmission level voltages, including energy storage facilities, that request interconnection with PJM and want to participate in PJM's wholesale power markets, must execute an Interconnection Service Agreement. Generators at local distribution or sub-transmission voltage levels may also request to participate in PJM's wholesale power market. However, they may not be under Federal Energy Regulatory Commission jurisdiction regarding the nature of their interconnection request. If not jurisdictional, each such generator must sign a Wholesale Market Participation Agreement instead of an Interconnection Service Agreement upon completion of all required reliability studies. A Wholesale Market Participation Agreement defines the terms and conditions under which PJM wholesale power market participation will be conducted. It also contains a milestone for the generator to execute, separately, an interconnection agreement with the local electric distribution company in accordance with the respective state's own established process.

As of this report, the number of projects listed in the PJM Interconnection queue has risen from 174 projects at this time in 2018 totaling 14,100 MW to 242 projects totaling 19,523 MW. Projects to date are listed in **Appendix F.**

It should be noted that a number of projects included in **Appendix F** may also be included in **Appendix C** under the projects' commercial project name versus a substation name as in the PJM queue. The commercial name in the PJM queue becomes public only after the System Impact Study is issued. Even then, not all developers have a commercial name once the System Impact Study is posted, and there is no tariff requirement for them to have one. As such, it is

difficult to cross-reference the data in **Appendix C** and **F**. **Appendix F** should only be taken as an indication of the recent and significant solar development activity focused in Virginia.

It would not be an understatement to say that navigating the PJM interconnection queue to the point of receiving an Interconnection Service Agreement or Wholesale Market Participation Agreement is a lengthy and expensive endeavor. Projects may be withdrawn at multiple points for not meeting specific milestones, or they may be withdrawn at the request of the project developer when the required studies determine system upgrade costs will be too expensive for the developer to bear. **Appendix F** also includes solar energy projects withdrawn from the PJM interconnection queue.

IV. 2019 Status of Energy Storage in Virginia

Virginia is home to the world's most powerful hydroelectric pumped storage generation facility. The Bath County Pumped Storage Station, located in the Allegheny Mountains along the central western border of Virginia, began commercial operations in 1985. The Station, jointly owned by Dominion Energy, Bath County Energy LLC, and Allegheny Power Systems, has a net generating capacity of 3,003 megawatts and is capable of powering 750,000 homes. Pumped storage hydroelectric technology has existed for decades and provides a cost-effective way to store electricity at scale. Pumped storage facilities store energy electromechanically. During times of low energy demand, water is pumped to an upper reservoir using lower-cost electricity from the grid. When demand for energy is high, water is released to a lower reservoir through tunnels, turning the turbines which generate electricity.

As a result of enabling state legislation 2017, Dominion Energy is exploring the potential for building a new hydro-electric pumped storage facility in southwest Virginia. As directed by the legislation, at least part of the electricity that would be used to power the new facility would be generated by renewable resources. Development of the project is still in early stages, and the project's final size and scope have not been determined. Before moving forward with the project, Dominion Energy would need to secure numerous local, state and federal permits and approvals.

The Virginia General Assembly has also taken steps to enable the development of battery storage technology in Virginia. The Grid Transformation and Security Act enacted in 2018 directs the Virginia State Corporation Commission to establish battery storage five-year pilot programs under which Dominion Energy Virginia and Appalachian Power Company each deploy an aggregate of up to 30 MW and 10 MW of battery storage, respectively. The legislation details specific goals to be accomplished by battery storage projects implemented under the pilot programs. The Virginia SCC adopted guidelines for the battery storage pilot programs in November 2018.

Dominion Resources installed solar coupled with a zinc iron redox flow battery made by Vizn Energy at Randolph Macon College in Ashland, Virginia as part of a microgrid test case.

Dominion Energy Battery Storage Pilot Projects

As facilitated by the above-referenced 2018 legislation, Dominion Energy Virginia filed an application with the SCC in August 2019 for three battery storage pilot projects that comprise 16 MW of battery storage in aggregate. Each project seeks to accomplish one or more of the specific goals set out in the legislation. The company's application is currently pending consideration in SCC Docket No. PUR-2019-00124.

- **Project 1 – Prevention of Solar Backfeeding**

Project 1 involves installation of a 2 MW/4 MWh, AC-coupled battery energy storage system ("BESS") at the company's Correctional Substation located in New Kent County, Virginia. This location was chosen because it has a feed with 20 MW of interconnected solar generation that frequently results in backfeeding to the transmission network.

- **Project 2 – Battery Energy Storage System as a Non-Wires Alternative**

Project 2 involves installation of a 2 MW/4 MWh AC-coupled BESS installed at the company's Hanover Substation in Ashland, Virginia. This location was chosen because a substation step-down transformer is expected to exceed its top nameplate rating during peak load conditions in the coming years.

- **Project 3 – Solar Plus Storage**

Project 3 involves installation of a 12 MW BESS, consisting of a 2 MW/8 MWh, DC-coupled system and a 10 MW/40, MWh AC-coupled system, at the company's 20 MW Scott Solar Facility in Powhatan County. Location of the BESS at the Scott Solar Facility will allow demonstration of

battery performance on the entire facility for peak shifting, and demonstration of a representative inverter block size for direct current clipping.

Appalachian Power Battery Storage Pilot Projects

Appalachian Power continues to review potential storage projects but at this time there is nothing planned in the near future.

It should be noted that outside of the Battery Storage Pilot Program, Appalachian Power installed two lithium-ion battery banks, for a total power rating of 4 MW at Byllesby Hydro. Byllesby hydroelectric plant is located on the New River in Carroll County, near the town of Byllesby, about 60 miles south-southwest of Roanoke. The Byllesby Battery project is the first hybridized system of its kind, pairing a hydroelectric generating facility with a battery storage system to provide grid support. American Electric Power (AEP), Appalachian Power's parent company, received one of just five 2019 Association of Edison Illuminating Companies Achievement Awards for the Byllesby Battery project[7].

As indicated by utility storage programs mainly being done on a pilot basis, as discussed above, battery storage in Virginia is still in its infancy. This may begin to change as battery storage costs continue to drop and as policy makers and utility regulators begin to understand the potential value that storage can have for both end-users with behind-the-meter storage and entire electric grids.

Energy storage applications in Virginia may include the following:

- The potential for increased grid resiliency and disaster preparedness by making communities more resilient to and helping them recover more quickly from natural disasters.
- The potential for demand charge reduction during peak periods, resulting in cost savings on utility bills.
- The potential to serve as a tool for demand response, as well as larger scale grid balancing.
- The ability to provide ancillary services to the grid such as frequency response and frequency regulation faster and more effectively than traditional generators.
- The ability to provide peaking capacity.
- The ability to serve as an alternative to traditional substation or line upgrades, as it can be sited nearly anywhere and can be implemented much more quickly than conventional system upgrades.

[7] https://aeic.org/2019-aeic-achievement-award-recipients/

- The ability to help integrate renewable energy by balancing fluctuations in generation, as well as allowing for the dispatch of renewably-generated electricity to other times of the day than when it is actually generated.

The inability to store surplus power (beyond the capacity of conventional storage technologies such as pumped hydro systems in Bath County and at Smith Mountain Lake) is becoming a more pressing problem in areas with the greater penetration of renewable energy deployment. Solar output, while relatively predictable, dips in cloudy conditions and is absent at night, while local wind speeds are hard to predict with confidence more than a few days into the future. Energy storage can provide grid operators, like PJM, a way to keep power supplies stable when renewable sources are not available. In providing grid ancillary services (voltage support, black start, VAR provision), batteries have the advantage of being quickly dispatchable or rampable (often in seconds) and, unlike traditional generation, can be more easily built and sited in key areas of the grid.

Given that the U.S. Department of Defense has prioritized developing resilient solutions for its naval infrastructure in Norfolk and the Hampton Roads region, and given the increased sense of urgency to protect the grid and create more resilient infrastructure that can overcome severe weather events, it would make sense for Virginia to explore ways to partner with the federal government on deployment of nanogrids and microgrids for regional emergency shelters and mission-critical facilities throughout the state.

The PJM Interconnection New Services Queue shows energy storage interconnection requests have grown by more than 500% since the 2018 Annual Report, increasing from ten projects totaling 735 MW to 32 projects totaling 3,730 MW.

Energy storage projects in the PJM interconnection queue are listed in **Appendix G**.

V. Solar Workforce Development

With the rapid growth of solar deployment predicted in Virginia there will be a need for skilled workers to meet the demand of data center growth and the Governor's Executive Order 43. To help meet this demand, twenty organizations including Southside Virginia Community College (SVCC), the Maryland-DC-Delaware-Virginia Solar Industries Association, Dominion Energy,

SOLAR HANDS-ON INSTRUCTIONAL NETWORK OF EXCELLENCE

Microsoft, leading solar developers, construction companies, and energy consulting & recruiting firms joined forces to launch **SHINE**, the *Solar Hands-On Instructional Network of Excellence*—a public-private partnership dedicated to building innovative solar career pathways in Virginia.

SHINE is dedicated to creating cutting edge, industry-recognized solar training programs that create structured pathways to stable, good paying, solar careers for Virginians. With 2 to 5 gigawatts of solar slated for construction in the state over the next four years, tens of thousands of full-time equivalent jobs are expected to be generated. SHINE is helping to ensure that Virginians are able to tap into these jobs and economic benefits, and that employers have access to a well-trained, top talent pool

Participants of SHINE's training program will graduate with industry standard OSHA safety credentials, foundational knowledge of solar photovoltaic systems, and hands-on experience performing the specific construction tasks that will be required for success on solar project installations. The pilot training program kicked off in the fall of 2019 in a newly built state-of-the-art learning lab at Southside Virginia Community College, and will expand to additional community colleges in 2020.

VI. Update on Authority Activities

The Authority held two meetings since the last Annual Report continuing to explore actual and perceived barriers to increased solar energy deployment and energy storage in Virginia. These include, but are not limited to, the lack of robust third-party ownership programs; Virginia's voluntary renewable portfolio standard; an absence of state tax credits like those that support solar development in neighboring states; perceived threats to net metering; prohibitions on non-utility community solar programs; soft costs (such as consumer acquisition and other non-equipment costs); a lack of standardized guidelines for zoning, permitting, etc., between localities; and relatively low electric rates compared to neighboring states and regional averages.

Given that utility-scale solar deployment has taken off on its own in recent years, the Authority continues to explore other areas where it can help enable and accelerate solar energy and energy storage deployment.

Energy Storage Study

In September 2018, DMME issued a Request for Proposals to undertake an energy storage study. Strategen Consulting of Berkeley, California was awarded the contract to perform the study.

The RFP asked the consultant to:

1. Complete a comprehensive and quantitative benefit-cost analysis of energy storage in the Commonwealth of Virginia. Quantitatively model the benefits of various levels of energy storage adoption across the generation, transmission and distribution systems, to include in front of and behind the meter energy storage at large electricity users (commercial and industrial customers), and residential customers to the extent feasible.

2. Provide five and ten-year outlooks for benefits and costs associated with energy storage (2024 and 2029), clearly stating the storage applications and use cases that will be examined (e.g. peaking plant replacement, renewable integration, energy time shifting, ancillary services, transmission and distribution system upgrade deferral, reliability, energy cost management for customers, etc.)

3. Identify and analyze any Federal and State regulatory barriers (e.g. residential/commercial/utility-scale ownership/operation, and/or aggregator/developer ownership/operation, market participation) that could prevent energy storage from full participation in electricity markets in Virginia and/or from providing the full range of benefits it is capable of providing to the energy system of Virginia. Suggest measures to remove those barriers and potential regulatory changes or incentives that could encourage or quicken the adoption of energy storage in Virginia.

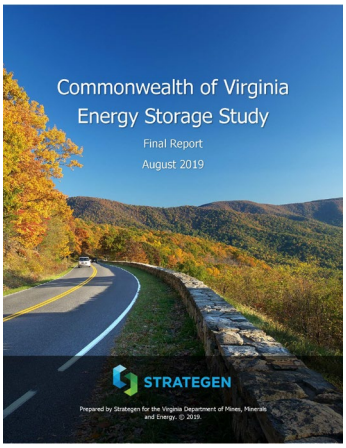
4. Clearly articulate what the Authority, the Legislature and the Governor can do to attract energy storage activity to the Commonwealth, including necessary changes to regulations, introduction of new, or modifications to, existing interconnection processes, and creation of incentives that could lead to desired outcomes.

   These could include, but are not limited to:

   a. Innovative ownership models for storage (e.g. utility, 3rd party, direct, etc.)
   b. Utility rate structures that could encourage the adoption of storage or storage co-located with solar PV;
   c. How utility, local, and regional *planning* processes can be improved to remove barriers to adopting storage;
   d. Changes to interconnection processes to reduce queue duration and automate screening;
   e. Current best practices in other states that have enabled adoption of energy storage;
   f. Others as applicable.

5. Identify and analyze any existing Federal and/or State regulations directly supporting adoption of energy storage. Specifically include an analysis of the impact of FERC Order 841 (intended to remove barriers to the participation of electric storage resources in the capacity, energy, and ancillary service markets operated by Regional Transmission Organizations and Independent System Operators) on the adoption of energy storage within the Commonwealth.

6. Identify and quantify economic benefits of energy storage unique to Virginia that are separate from direct grid and electricity consumer benefits. Specifically:
    a. Survey of jobs created by energy storage development and related works (engineering, construction and manufacturing related to the development, deployment and design of energy storage projects in Virginia)
    b. Survey of companies located in Virginia participating in part of the value chain of energy storage



7. Identify benefits that energy storage could provide to Virginia. Discuss safety as energy storage is adopted at scale at the utility level and behind the meter, including current best practices that enable storage adoption while maintaining the highest standards of safety.

8. Participate in a one-day stakeholder engagement workshop after the publication of the interim report, and incorporating feedback received into the final report.

The 2019 Commonwealth Energy Storage Study was completed by the September 30, 2019 deadline. The Executive Summary includes recommendations supported by this Authority.

VII. Future Goals and Activities

1. Continue to engage with stakeholders to identify avenues for increased solar deployment to meet the recommendations from the Virginia Energy Plan, Executive Order 43, and the Grid Act to advance solar energy and energy storage deployment.

2. Support DMME and the Virginia Community College System as they develop an RFP and model Power Purchase Agreement for deployment of 3rd party owned solar energy at state facilities.

3. Explore possibilities for the use of state land and facilities for energy storage deployment.

4. Support the new DMME Solar Program Coordinator in outreach to local officials to assist them in addressing land use or other issues that affect the development of solar while also protecting the interests of the locality.

5. Continue to investigate, analyze, and raise awareness about perceived barriers to expanding solar energy and energy storage in Virginia, and explore possible remedies.

6. Provide recommendations to Virginia investor-owned utilities, municipalities, cooperatives and large energy consumers on how to remove barriers to evaluating solar energy and energy storage on a level playing field with other resources.

7. Evaluate programs that can expand access to solar energy and energy storage for all customers in Virginia.

8. Continue to explore and facilitate the use of creative financing mechanisms that can expedite and expand solar and energy storage deployment.

9. Support ways to recapitalize the VirginiaSAVES program.

10. Develop, maintain and update a Virginia Solar Energy and Energy Storage Authority website to include regular updates of information on installed solar energy and energy storage capacity and other consumer information.

11. Provide technical support to state and local economic development entities and identify financial incentives that may be available to help support solar energy and energy storage development to create Virginia jobs.

12. Support exploration of public private partnerships to create microgrids to increase resilience for mission-critical infrastructure and regional emergency shelters.

13. Explore additional community-based solar ownership models.

14. Explore opportunities to enhance and simplify tracking the amount of solar energy and energy storage deployed in the Commonwealth by utilities and others.

It should be noted that the Virginia Air Pollution Control Board approved a final CO_2 Cap and Trade Rule (9 VAC 5-140-6045) that includes a provision that Virginia join and participate in the Regional Greenhouse Gas Initiative, or RGGI, a market-based program from Maryland into the northeast designed to reduce power sector CO_2 emissions. RGGI is composed of individual CO_2 Budget Trading Programs in each participating state. Through independent regulations, based on the RGGI Model Rule, each state's CO_2 Budget Trading Program limits emissions of CO_2 from electric power plants, issues CO_2 allowances and establishes participation in regional CO_2 allowance auctions. Virginia's rules would reduce CO2 emissions by 30% by 2030.

However, language was inserted by the General Assembly into the 2018-2020 biennial budget bill prohibiting Virginia from participating in RGGI without the General Assembly's approval, essentially halting implementation of the Rule. The specific budget language states:

> "a. Notwithstanding any other provision of the Code of Virginia, no expenditures from the general, special, or other non-general fund sources from any appropriation by the General

> Assembly shall be used to support membership or participation in the Regional Greenhouse Gas Initiative (RGGI) until such time as the General Assembly has approved such membership as evidenced by language authorizing such action in the Appropriation Act, with the exception of any expenditures required pursuant to any contract signed prior to the passage of this act by the General Assembly, nor shall any RGGI auction proceeds be used to supplement any appropriation in this act without express General Assembly approval."

The Rule specifies that 5% of the conditional allowances be allocated to DMME and upon auctioning, the funds be used "…for the abatement and control of air pollution, specifically CO2, by the implementation of programs that lower base and peak electricity demand…" This may have included opportunities to advance solar energy across the Commonwealth.

APPENDIX A

Enabling Legislation (Amended 2017)

APPENDIX A

Enabling Legislation (Amended 2017)

§ 67-1501. (Expires July 1, 2025) Authority created; purpose.

The Virginia Solar Energy Development and Energy Storage Authority is continued as the Virginia Solar Energy Development and Energy Storage Authority. The Authority constitutes a body corporate and a political subdivision of the Commonwealth and as such shall have, and is vested with, all of the politic and corporate powers as are set forth in this chapter. The Authority is established for the purposes of (i) facilitating, coordinating, and supporting the development, either by the Authority or by other qualified entities, of the solar energy and energy storage industries and solar energy and energy storage projects by developing programs that increase the availability of financing for solar energy projects and energy storage projects; (ii) facilitating the increase of solar energy generation systems and energy storage projects on public and private sector facilities in the Commonwealth; (iii) promoting the growth of the Virginia solar and energy storage industries; (iv) providing a hub for collaboration between entities, both public and private, to partner on solar energy projects and energy storage projects; and (v) positioning the Commonwealth as a leader in research, development, commercialization, manufacturing, and deployment of energy storage technology. The Authority may also consult with research institutions, businesses, nonprofit organizations, and stakeholders as the Authority deems appropriate. The Authority shall have only those powers enumerated in this chapter.

§ 67-1502. (Expires July 1, 2025) Membership; terms; vacancies; expenses.

A. The Authority shall be composed of 15 nonlegislative citizen members appointed as follows: Eight members shall be appointed by the Governor; four members shall be appointed by the Speaker of the House of Delegates; and three members shall be appointed by the Senate Committee on Rules. All members of the Authority shall reside in the Commonwealth. Members may include representatives of solar businesses, solar customers, renewable energy financiers, state and local government solar customers, institutions of higher education who have expertise in energy technology, and solar research academics.

B. Except as otherwise provided herein, all appointments shall be for terms of four years each. No member shall be eligible to serve more than two successive four-year terms. After

expiration of an initial term of three years or less, two additional four-year terms may be served by such member if appointed thereto. Appointments to fill vacancies, other than by expiration of a term, shall be made for the unexpired terms. Any appointment to fill a vacancy shall be made in the same manner as the original appointment. The remainder of any term to which a member is appointed to fill a vacancy shall not constitute a term in determining the member's eligibility for reappointment.

C. The initial appointments of members by the Governor made pursuant to Chapters 90 and 398 of the Acts of Assembly of 2015 shall be as follows: two members shall be appointed for terms of four years, two members shall be appointed for terms of three years, and two members shall be appointed for terms of two years. The initial appointments of members by the Speaker of the House of Delegates made pursuant to Chapters 90 and 398 of the Acts of Assembly of 2015 shall be as follows: one member shall be appointed for a term of four years, one member shall be appointed for a term of three years, and one member shall be appointed for a term of two years. The initial appointments of members by the Senate Committee on Rules made pursuant to Chapters 90 and 398 of the Acts of Assembly of 2015 shall be as follows: one member shall be appointed for a term of four years, and one member shall be appointed for a term of three years. Thereafter all appointments shall be for terms of four years.

D. The Authority shall appoint from its membership a chairman and a vice-chairman, both of whom shall serve in such capacities at the pleasure of the Authority. The chairman, or in his absence the vice-chairman, shall preside at all meetings of the Authority. The meetings of the Authority shall be held on the call of the chairman or whenever a majority of the members so request. A majority of members of the Authority serving at any one time shall constitute a quorum for the transaction of business.

E. Members shall serve without compensation. However, all members may be reimbursed for all reasonable and necessary expenses incurred in the performance of their duties as provided in §§ 2.2-2813 and 2.2-2825. Such expenses shall be paid from such funds as may be appropriated to the Authority by the General Assembly.

F. Members of the Authority shall be subject to the standards of conduct set forth in the State and Local Government Conflict of Interests Act (§ 2.2-3100 et seq.) and may be removed from office for misfeasance, malfeasance, nonfeasance, neglect of duty, or misconduct in the manner set forth therein.

G. Except as otherwise provided in this chapter, members of the Authority shall be subject to the provisions of the Virginia Freedom of Information Act (§ 2.2-3700 et seq.).

§ 67-1503. (Expires July 1, 2025) Partnerships.

A. The Authority may establish public-private partnerships with entities pursuant to the Public-Private Education Facilities and Infrastructure Act of 2002 (§ 56-575.1 et seq.) to increase the number of solar energy generation systems on or located adjacent to public and private facilities in the Commonwealth. Any partnership established pursuant to this section shall stipulate that the Authority and the developers shall share the costs of the installation and operation of solar energy facilities and equipment.

B. The Authority may provide a central hub for appropriate entities, both public and private, to enter into partnerships that result in solar energy generation projects being developed in the Commonwealth. The Authority may act as a good faith broker in these matters to facilitate appropriate partnerships, including public-private partnerships.

§ 67-1504. (Expires July 1, 2025) Federal loan guarantees.

A. The Authority, on behalf of the Commonwealth, may apply to the U.S. Department of Energy for federal loan guarantees authorized or made available pursuant to Title XVII of the Energy Policy Act of 2005, 42 U.S.C. § 16511 et seq., the American Recovery and Reinvestment Act of 2009, P.L. 111-5, or other similar federal legislation, to facilitate the development of solar energy projects.

B. Upon obtaining federal loan guarantees for solar energy projects pursuant to subsection A, the Authority, subject to any restrictions imposed by federal law, may allocate or assign all or portions thereof to qualified third parties, on such terms and conditions as the Authority finds are appropriate. Actions of the Authority relating to the allocation and assignment of such loan guarantees shall be exempt from the provisions of the Administrative Process Act (§ 2.2-4000 et seq.) pursuant to subdivision B 4 of § 2.2-4002. Decisions of the Authority shall be final and not subject to review or appeal.

§ 67-1505. (Expires July 1, 2025) Powers and duties of the Authority.

In addition to such other powers and duties established under this chapter, the Authority shall have the power and duty to:

1. Adopt, use, and alter at will an official seal;

2. Make bylaws for the management and regulation of its affairs;

3. Maintain an office at such place or places within the Commonwealth as it may designate;

4. Accept, hold, and administer moneys, grants, securities, or other property transferred, given, or bequeathed to the Authority, absolutely or in trust, from any source, public or private, for the purposes for which the Authority is created;

5. Make and execute contracts and all other instruments and agreements necessary or convenient for the exercise of its powers and functions;

6. Employ, in its discretion, consultants, attorneys, architects, engineers, accountants, financial experts, investment bankers, superintendents, managers, and such other employees and agents as may be necessary and fix their compensation to be payable from funds made available to the Authority;

7. Invest its funds as permitted by applicable law;

8. Receive and accept from any federal or private agency, foundation, corporation, association, or person grants, donations of money, or real or personal property for the benefit of the Authority, and receive and accept from the Commonwealth or any state, and from any municipality, county, or other political subdivision thereof and any other source, aid or contributions of either money, property, or other things of value, to be held, used, and applied for the purposes for which such grants and contributions may be made;

9. Enter into agreements with any department, agency, or instrumentality of the United States or of the Commonwealth and with lenders and enter into loans with contracting parties for the purpose of planning, regulating, and providing for the financing or assisting in the financing of any project;

10. Do any lawful act necessary or appropriate to carry out the powers herein granted or reasonably implied;

11. Identify and take steps to mitigate existing state and regulatory or administrative barriers to the development of the solar energy and energy storage industries, including facilitating any permitting processes;

12. Enter into interstate partnerships to develop the solar energy industry, solar energy projects, and energy storage projects;

13. Collaborate with entities, including institutions of higher education, to increase the training and development of the workforce needed by the solar and energy storage industries in the Commonwealth, including industry-recognized credentials and certifications;

14. Conduct any other activities as may seem appropriate to increase solar energy generation in the Commonwealth and the associated jobs and economic development and competitiveness benefits, including assisting investor-owned utilities in the planned

deployment of at least 400 megawatts of solar energy projects in the Commonwealth by 2020 through entering into agreements in its discretion in any manner provided by law for the purpose of planning and providing for the financing or assisting in the financing of the construction or purchase of such solar energy projects authorized pursuant to § 56-585.1;

15. Promote collaborative efforts among Virginia's public and private institutions of higher education in research, development, and commercialization efforts related to energy storage;

16. Monitor relevant developments in energy storage technology and deployment nationally and globally and disseminate relevant information and research results; and

17. Identify and work with the Commonwealth's industries and nonprofit partners in advancing efforts related to the development and commercialization of energy storage.

§ 67-1506. (Expires July 1, 2025) Director; staff; counsel to the Authority.

A. The Director of the Department of Mines, Minerals and Energy shall serve as Director of the Authority and shall administer the affairs and business of the Authority in accordance with the provisions of this chapter and subject to the policies, control, and direction of the Authority. The Director may obtain non-state-funded support to carry out any duties assigned to the Director. Funding for this support may be provided by any source, public or private, for the purposes for which the Authority is created. The Director shall maintain, and be custodian of, all books, documents, and papers of or filed with the Authority. The Director may cause copies to be made of all minutes and other records and documents of the Authority and may give certificates under seal of the Authority to the effect that such copies are true copies, and all persons dealing with the Authority may rely on such certificates. The Director also shall perform such other duties as prescribed by the Authority in carrying out the purposes of this chapter.

B. The Department of Mines, Minerals and Energy shall serve as staff to the Authority.

C. The Office of the Attorney General shall provide counsel to the Authority.

§ 67-1507. (Expires July 1, 2025) Annual report.

On or before October 15 of each year, beginning in 2016, the Authority shall submit an annual summary of its activities and recommendations to the Governor and the Chairmen of the House Appropriations Committee, the Senate Finance Committee, and the House and Senate Commerce and Labor Committees.

§ 67-1508. (Expires July 1, 2025) Confidentiality of information.

A. The Authority shall hold in confidence the personal and financial information supplied to it, or maintained by it, concerning the siting and development of solar energy projects and energy storage projects.

B. Nothing in this section shall prohibit the Authority, in its discretion, from releasing any information that has been transformed into a statistical or aggregate form that does not allow the identification of the person who supplied particular information.

C. Information supplied by or maintained on persons or entities applying for or receiving allocations of federal loan guarantees, as well as specific information relating to the amount and identity of recipients of such distributions, shall be subject to disclosure in accordance with the Virginia Freedom of Information Act (§ 2.2-3700 et seq.).

§ 67-1509. (Expires July 1, 2025) Declaration of public purpose; exemption from taxation.

A. The exercise of the powers granted by this chapter shall be in all respects for the benefit of the citizens of the Commonwealth and for the promotion of their welfare, convenience, and prosperity.

B. The Authority shall be performing an essential governmental function in the exercise of the powers conferred upon it by this chapter, and the property of the Authority and its income and operations shall be exempt from taxation or assessments upon any property acquired or used by the Authority under the provisions of this chapter.

APPENDIX B

Virginia Solar Energy Development and Energy Storage Authority Members

Virginia Solar Energy Development and Energy Storage Authority Members

Member/Organization	Appointed By	Term Expires
Paul Duncan GSD Energy Consultants	Governor	6/30/21
John Ockerman Ockerman Automation	Governor	6/30/23
Damian Pitt Associate Professor, VCU	Governor	6/30/22
Careth Cody Apperson Nystrom Managing Director, SJF Ventures	Governor	6/30/22
Cliona Mary Robb Director, ThompsonMcMullan	Governor	6/30/23
Hayes Framme Ørsted	Governor	6/30/21
Colleen A. Lueken, PhD AES Energy Storage, Director of Market Analytics	Governor	6/30/20
Will Gathright Tumalow, Inc., Founder	Governor	6/30/21
Jon F. Hillis CEO, SolUnesco	Speaker of the House	6/30/21
John H. Rust, Jr. Commissioner CoA-FFX	Speaker of the House	6/30/22
Ryan L. Dunn Executive Vice President of Corporate and Government Affairs Virginia Chamber of Commerce	Speaker of the House	6/30/21
Brian M. Gordon Vice President of Government Affairs Apartment and Office Building Association of Metropolitan Washington	Speaker of the House	6/30/21
Kenneth G. Hutcheson Old Dominion Public Affairs	Senate Committee on Rules	6/30/22
Katharine Bond Vice President, Public Policy & State Affairs Dominion Energy	Senate Committee on Rules	6/30/23
Andrew T. Lamar Principal, Lamar Consulting, LLC	Senate Committee on Rules	6/30/20

APPENDIX C

Solar Deployment in Virginia

Solar Energy Projects and Capacity Installed in Virginia.

Distributed (Net Metered) Solar

System Owner	Location	Capacity (MW)
9,949 Distributed Individual Utility Customers	Distributed Across State	
	Total	**90.5**

Behind-the-Meter - Not Net Metered

System Owner	Location	Capacity (MW)
Norfolk Naval "Monkey Bottom"	Norfolk Naval Base	2
Dept. Military Affairs	Ft. Pickett	0.55
	Total	**2.6**

Dominion Energy Solar (Details in Appendix "X")

Operational	Under Development	Total (MW)
436	1,536	
	Total	**1,972**

Cooperative Utility Solar

Cooperative	Location	Capacity (MW)
Central Virginia Electric Cooperative	Goochland County	5
Central Virginia Electric Cooperative	Fluvanna County	5
BARC Electric Cooperative	Fauquier County	0.55
	Total	**10.6**

Municipal Utility Solar

Municipality	Capacity (MW)
Town of Bedford	3
Town of Front Royal	3
City of Danville	6
TOTAL:	**12.0**

Dominion Energy Solar Partnership Projects

Project Site	Location	Capacity (MW)
Old Dominion University	Norfolk	0.1
Capital One	Chesterfield County	0.5
Virginia Union University	Richmond	0.1
Prologis Concorde Center	Loudoun County	0.7
Randolph-Macon College	Ashland	0.1
Philip Morris Park 500	Chesterfield County	2.0
Western Branch High School	Chesapeake	0.8
Merck	Rockingham County	1.5
University of Virginia	Charlottesville	0.4
Canon	Newport News	1
	Total:	**7.2**

Dominion PPA Pilot - Installed

Owner-Operator	Customer-Generator Facility Location	Duration of Purchase Agreement	Placed in Service Date	Total Pilot kW
Richmond Solar, LLC	University of Richmond Richmond, Va. 23173	20 Years	5/26/2016	187.25
Albemarle Solar, LLC	Albemarle High School Charlottesville, Va. 22901	20 Years	9/15/2016	112.00
Albemarle Solar, LLC	Baker-Butler Elementary School Charlottesville, Va. 22911	20 Years	9/15/2016	199.00
Albemarle Solar, LLC	Brownsville Elementary School Crozet, Va. 22932	20 Years	9/15/2016	107.00
Albemarle Solar, LLC	Monticello High School Charlottesville, Va. 22902	20 Years	9/15/2016	219.00
Albemarle Solar, LLC	Mortimer Sutherland Middle School Charlottesville, Va. 22911	20 Years	9/15/2016	224.00
Albemarle Solar, LLC	Mary A. Greer Elementary School Charlottesville, Va. 22901	20 Years	9/15/2016	56.00
Lylburn Solar, LLC	Lylburn-Downing Middle School Lexington, Va. 24450	20 Years	9/21/2016	84.00
Altenergy, Inc.	Westminster Presbyterian Church Charlottesville, Va. 22903	7 Years	6/7/2017	12.80
Stone Air Solar, LLC Operator: Sun Tribe Solar, LLC	St. Anne's Belfield School, Inc Charlottesville, Va. 22903	6 Years	9/15/2017	315.40

Gordonsville Holdings, LLC Operator: Sun Tribe Solar, LLC	Green Applications, LLC Gordonsville, Va. 22942	20 Years	12/14/2017	620.00
Convert Solar, LLC	Unity Renaissance Chesapeake, Va. 23320	10 Years	4/11/2018	20.00
CMA Properties, Inc Operator: Sun Tribe Solar, LLC	HCM/MTE Associates, Inc Charlottesville, Va. 22901	20 Years	6/22/2018	150.00
Sun Dogs, LLC Operator: Convert Solar, LLC	Norfolk Academy - Maintenance Norfolk, Va. 23502	7 Years	7/13/2018	40.00
Sun Tribe Solar, LLC	Middlesex County Public Schools Saluda, Va. 23149	25 Years	8/16/2018	850.00
Cougar Solar, LLC	Collegiate School - Centennial Hall Richmond, Va. 23229	20 Years	9/1/2018	9.98
Cougar Solar, LLC	Collegiate School - Robins Campus Richmond, Va. 23233	20 Years	9/1/2018	67.60
Cougar Solar, LLC	Collegiate School - Sharp Academic Commons Richmond, Va. 23229	20 Years	9/1/2018	20.00
Tesla Energy Operations, Inc.	Washington & Lee University Lexington, Va. 24450	20 Years	10/24/2018	72.00
Sun Tribe Solar, LLC	Peabody School, Inc Charlottesville, Va. 22902	25 Years	10/31/2018	100.00
DRPC Solar, LLC	Daniels Run Peace Church Fairfax, Va. 22030	20 Years	10/31/2018	8.89
Sun Dogs, LLC Operator: Convert Solar, LLC	Norfolk Academy - South Campus Norfolk, Va. 23502	7 Years	12/28/2018	492.00
Tesla Energy Operations, Inc.	Virginia Union University - Library Richmond, Va. 23220	20 Years	3/1/2019	144.00
Convert Solar, LLC	Williamsburg Unitarian Universalists Williamsburg, Va. 23185	10 Years	4/1/2019	43.20
STS Joan Bosch, LLC Operator: Sun Tribe Solar, LLC	Westmoreland County Public Schools Hague, Va. 22469	25 Years	4/24/2019	660.00
Convert Solar, LLC	St. Andrew Presbyterian Suffolk, Va. 23433	10 Years	5/8/2019	30.00
Augustas Solar,LLC	Riverheads Elementary School Staunton, Va. 24401	20 Years	7/1/2019	230.00
Augustas Solar,LLC	Riverheads High School Staunton, Va. 24401	20 Years	7/1/2019	88.00

Augustas Solar,LLC	Wilson Elementary School Fishersville, Va. 22939	20 Years	7/8/2019	276.00
Norfolk Solar Qualified Opportunity Zone Business LLC Operator: Convert Solar LLC	J.D. Miles & Sons, Inc Chesapeake, Va. 23324	7 Years	7/8/2019	52.00
Augustas Solar,LLC	Wilson Middle School Fishersville, Va. 22939	20 Years	7/31/2019	231.00
CE SPE One LLC Operator: Convert Solar LLC	Immaculate Conception Hampton, Va. 23666	20 Years	8/5/2019	116.00
Norfolk Solar Qualified Opportunity Zone Business LLC Operator: Convert Solar LLC	CozyPure Organic Comfort Zone Norfolk, Va. 23517	7 Years	9/19/2019	52.20
RPS Solar, LLC	Linwood Holton Elementary School Richmond, Va. 23227	20 Years	9/23/2019	120.00
RPS Solar, LLC	Huguenot High School Richmond, Va. 23225	20 Years	9/23/2019	540.00
RPS Solar, LLC	M.J. Jones Elementary School Richmond, Va. 23225	20 Years	9/23/2019	111.00
RPS Solar, LLC	Oak Grove Elementary School Richmond, Va. 23224	20 Years	9/23/2019	150.00
RPS Solar, LLC	J.H. Blackwell Elementary School Richmond, Va. 23224	20 Years	9/23/2019	148.00
RPS Solar, LLC	Martin Luther King Jr. Middle School Richmond, Va. 23223	20 Years	9/25/2019	433.00
RPS Solar, LLC	Lucille Murray Brown Middle School Richmond, Va. 23225	20 Years	9/25/2019	360.00
ForeFront Power, LLC	Devils Backbone Outpost Taproom and Kitchen Lexington, Va. 24450	15 Years	9/25/2019	453.33
Norfolk Solar Qualified Opportunity Zone Business, LLC Operator: Convert Solar, LLC	Norfolk Machine & Welding, Inc. Norfolk, Va. 23517	7 Years	9/30/2019	100.00
			Total (MW)	**8.3**

Dominion PPA Pilot – Notices of Intent (NOI) to Install

Owner-Operator	Customer-Generator Facility Location	Duration of Purchase Agreement	Total Pilot kW
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Shen Village Op Center Waynesboro, Va. 22980	25 Years	42.042
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Shen Village Plaza Waynesboro, Va. 22980	25 Years	58.212
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Verona Verona, Va. 24482	25 Years	11.977
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Community Way Staunton, Va. 24401	25 Years	14.413
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Riverside Waynesboro, Va. 22980	25 Years	23.751
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Stuarts Draft Stuarts Draft, Va. 24477	25 Years	12.180
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Lexington Lexington, Va. 24450	25 Years	15.225
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Woodstock Woodstock, Va. 22664	25 Years	17.052
Solaris Energy LLC DBA "Dupont Renewable Energy LLC"	DCCU, Lucy Lane Waynesboro, Va. 22980	25 Years	15.022
Tesla Energy Operations, Inc.	VA. Union University - Lombardy 1 Richmond, Va. 23220	20 Years	91.60
Tesla Energy Operations, Inc.	VA. Union University - Lombardy 2 Richmond, Va. 23220	20 Years	192.30
RPS Solar, LLC	G.H. Reid Elementary School Richmond, Va. 23225	20 Years	128.50

RPS Solar, LLC	Broad Rock Elementary School Richmond, Va. 23234	20 Years	148.50
RPS Solar, LLC	J.B. Fisher Elementary School Richmond, Va. 23235	20 Years	114.60
Sun Tribe Solar, LLC	Arlington Co Public Schools - Tuckahoe Elementary School Arlington, Va. 22213	25 Years	17.90
Sun Tribe Solar, LLC	Fleet Elementary School Arlington, Va. 22204	25 Years	466.20
Sun Tribe Solar, LLC	Arlington Co Public Schools - Jefferson Middle School Arlington, Va. 22204	25 Years	316.80
Sun Tribe Solar, LLC	Middlesex County Public Schools - Middlesex High School Saluda, Va. 23149	25 Years	680.00
Sun Tribe Solar, LLC	Arlington Co Public Schools - Kenmore Middle School Arlington, Va. 22204	25 Years	432.90
Sun Tribe Solar, LLC	Arlington Co Public Schools - Washington-Lee High School Arlington, Va. 22201	25 Years	832.50
Sun Tribe Solar, LLC	King William County Public Schools - Acquinton Elementary School King William, Va. 23086	30 Years	686.10
Sun Tribe Solar, LLC	King William County Public Schools - Cool Spring Elementary School King William, Va. 23086	30 Years	547.50
Sun Tribe Solar, LLC	King William County Public Schools - Hamilton Holmes Middle School King William, Va. 23086	30 Years	478.20
Waynesboro Solar, LLC	Kate Collins Middle School Waynesboro, Va. 22980	20 Years	295.00
Waynesboro Solar, LLC	Waynesboro High School Waynesboro, Va. 22980	20 Years	153.70
Waynesboro Solar, LLC	Westwood Hills Elentary School Waynesboro, Va. 22980	20 Years	153.40
Waynesboro Solar, LLC	William Perry Elementary School Waynesboro, Va. 22980	20 Years	170.80

Norfolk Solar Qualified Opportunity Zone Business LLC Operator: Convert Solar LLC	First Baptist Church of Berkley Norfolk, Va. 23523	7 Years	53.30
Sun Tribe Solar, LLC	Fluvanna County Public Schools - Carysbrook Elementary School Palmyra, Va. 22963	30 Years	540.00
Sun Tribe Solar, LLC	Fluvanna County Public Schools - Central Elementary School Palmyra, Va. 22963	25 Years	390.00
Sun Tribe Solar, LLC	Fluvanna County Public Schools - West Central Primary School Palmyra, Va. 22963	30 Years	390.00
Sun Tribe Solar, LLC	Fluvanna County Public Schools - Fluvanna Middle School Palmyra, Va. 22963	30 Years	800.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Cool Spring Elementary School Ashland, Va. 23116	30 Years	230.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Hanover High School Ashland, Va. 23116	30 Years	480.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Laurel Meadow Elementary School Ashland, Va. 23111	30 Years	260.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Oak Knoll Middle School Ashland, Va. 23116	30 Years	611.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Pearson's Corner Elementary School Ashland, Va. 23116	30 Years	520.00
Sun Tribe Solar, LLC	Hanover County Public Schools - Kersey Creek Elementary School Ashland, Va. 23116	30 Years	552.00
Sun Tribe Solar, LLC	Hanover County Public Schools - The Georgetown School Ashland, Va. 23116	30 Years	104.00
Sun Tribe Solar, LLC	Hanover County Public Schools - The Hanover Center for Trades & Technology Ashland, Va. 23116	30 Years	221.00
Sun Tribe Solar, LLC	Powhatan County Public Schools - Flat Rock Elementary School Powhatan, Va. 22963	25 Years	260.00

Sun Tribe Solar, LLC	Powhatan County Public Schools - Pocahontas Elementary School Powhatan, Va. 22963	25 Years	300.00
Sun Tribe Solar, LLC	Powhatan County Public Schools - Powhatan Elementary School Powhatan, Va. 22963	25 Years	339.00
Sun Tribe Solar, LLC	Powhatan County Public Schools - Powhatan Middle School Powhatan, Va. 22963	25 Years	390.00
Sun Tribe Solar, LLC	Westmoreland County School Board - Washington District Elementary School Montross, Va. 22520	25 Years	300.00
Sun Tribe Solar, LLC	Shenandoah County Public Schools - Triplett Tech Mount Jackson, Va. 22842	30 Years	240.00
Sun Tribe Solar, LLC	County of Henrico - Libbie Mill Library Richmond, Va. 23230	25 Years	100.00
Sun Tribe Solar, LLC	County of Henrico - Mental Health East Clinic Richmond, Va. 23223	25 Years	225.00
Shalom Solar LLC	Temple Rodef Shalom Falls Church, Va. 22043	20 Years	97.00
Sun Tribe Solar, LLC	Northumberland County School Board - Northumberland Middle & High School Heathsville, Va. 22473	25 Years	1000.00
Sun Tribe Solar, LLC	Virginia Beach City Public Schools - College Park Elementary School Virginia Beach, Va. 23456	25 Years	166.50
Sun Tribe Solar, LLC	Virginia Beach City Public Schools - Ocean Lakes Elementary School Virginia Beach, Va. 23456	25 Years	333.00
Sun Tribe Solar, LLC	Virginia Beach City Public Schools - Princess Anne Middle School Virginia Beach, Va. 23456	25 Years	566.10
Sun Tribe Solar, LLC	Virginia Beach City Public Schools - Renaissance Academy Virginia Beach, Va. 23456	25 Years	732.60
Norfolk Solar Qualified Opportunity Zone Business LLC Operator: Convert Solar LLC	Ironclad Distillery Co. Newport News, Va. 23607	7 Years	52.20
Augustas Solar, LLC	The Augusta County School Board S. Gordon Stewart Middle School Fort Defiance, Va. 24437	25 Years	120.00

Augustas Solar, LLC	The Augusta County School Board Wilson Memorial High School Fishersville, Va. 22939	20 Years	480.00
Citrus Solar, LLC	Orange County Public Schools - Orange County Elementary School Orange, Va. 22960	25 Years	190.00
Citrus Solar, LLC	Orange County Public Schools - Orange County High School Orange, Va. 22960	25 Years	215.00
Citrus Solar, LLC	Orange County Public Schools - Orange County High Shool Field House Orange, Va. 22960	25 Years	123.00
Citrus Solar, LLC	Orange County Public Schools - Prospect Heights Middle School Orange, Va. 22960	25 Years	192.00
Citrus Solar, LLC	Orange County Public Schools - Taylor Education Administrative Complex Orange, Va. 22960	25 Years	204.00
Sun Tribe Solar, LLC	Newport News Public Schools - Lee Hall Elementary School Newport News, Va. 23606	30 Years	480.00
Sun Tribe Solar, LLC	Newport News Public Schools - Gatewood Peep PreK-8 School Newport News, Va. 23606	30 Years	144.00
Sun Tribe Solar, LLC	Newport News Public Schools - Yates Elementary School Newport News, Va. 23606	30 Years	172.80
Sun Tribe Solar, LLC	Newport News Public Schools - Heritage High School Newport News, Va. 23606	30 Years	600.00
Sun Tribe Solar, LLC	Newport News Public Schools - Discovery STEM Academy Newport News, Va. 23606	30 Years	240.00
Shelter Solar, LLC	CARITAS Richmond, Va. 23224	25 Years	360.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability- Slaughter Recreation Center Charlottesville, Va. 22903	25 Years	222.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability- UVA. University Data Center Charlottesville, Va. 22903	25 Years	50.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability- Zehmer Hall Charlottesville, Va. 22903	25 Years	58.00

Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Parking and Transportation Services Building Charlottesville, Va. 22903	25 Years	173.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Aquatic and Fitness Center Charlottesville, Va. 22904	25 Years	193.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Carruthers Hall Charlottesville, Va. 22903	25 Years	151.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Facilities Management Shop Buildings Charlottesville, Va. 22904	25 Years	156.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Fontana Foods Charlottesville, Va. 22903	25 Years	395.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-John Paul Jones Arena Charlottesville, Va. 22903	25 Years	775.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Leake Building Charlottesville, Va. 22904	25 Years	64.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-McCue Center Charlottesville, Va. 22904	25 Years	186.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-Mechanical Engineering Building Charlottesville, Va. 22903	25 Years	115.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-North Ground Rec Center Charlottesville, Va. 22903	25 Years	167.00
Sun Tribe Solar, LLC	University of Virginia Office of Sustainability-UVA. Printing Service Center Charlottesville, Va. 22903	25 Years	229.00
Sun Tribe Solar, LLC	Arlington Public Schools - Reed Elementary School Arlington, Va. 22205	25 Years	367.70
Sun Tribe Solar, LLC	Arlington Public Schools - Wakefield High School Arlington, Va. 22206	25 Years	299.70

Sun Tribe Solar, LLC	Arlington Public Schools - Abingdon Elementary School Arlington, Va. 22206	25 Years	266.40
Sun Tribe Solar, LLC	Arlington Public Schools - McKinley Elementary School Arlington, Va. 22205	25 Years	133.20
Sun Tribe Solar, LLC	Louisa County Public Schools - Louisa High School's Gymnasium Mineral, Va. 23117	30 Years	704.00
Sun Tribe Solar, LLC	Louisa County Public Schools - Louisa Middle School Mineral, Va. 23117	30 Years	1000.00
Sun Tribe Solar, LLC	Louisa County Public Schools - Louisa High School Mineral, Va. 23117	30 Years	1000.00
Sun Tribe Solar, LLC	Newport News Public Schools - Gildersleeve Middle School Newport News, Va. 23606	30 Years	600.00
Sun Tribe Solar, LLC	Newport News Public Schools - Hines Middle School Newport News, Va. 23601	30 Years	600.00
Sun Tribe Solar, LLC	Newport News Public Schools - Saunders Elementary School Newport News, Va. 23601	30 Years	300.00
Sun Tribe Solar, LLC	Newport News Public Schools - Achievable Dream Middle and High School Newport News, Va. 23605	30 Years	600.00
Sun Tribe Solar, LLC	Newport News Public Schools - Newport News Public Schools Administration Building Newport News, Va. 23606	30 Years	360.00
Sun Tribe Solar, LLC	Virginia Beach Public Schools - Thoroughgood Elementary School Virginia Beach, Va. 23455	25 Years	350.00
Sun Tribe Solar, LLC	Virginia Beach Public Schools - Kellam High School Virginia Beach, Va. 23456	25 Years	700.00
Sun Tribe Solar, LLC	Northumberland County Public Schools - Northumberland Elementary School Heathsville, Va. 22473	25 Years	720.00
Sun Tribe Solar, LLC	Charles City County Public Schools - Charles City County Middle and High School Charles City, Va. 23030	30 Years	900.00

Sun Tribe Solar, LLC	Charles City County Public Schools - Charles City County Elementary School Charles City, Va. 23030	30 Years	480.00
Sun Tribe Solar, LLC	Senior Center, Inc - Center at Belvedere Charlottesville, Va. 22901	25 Years	200.00
		Total (MW)	**40.5**

Permit by Rule (PBR) – NOI to File for Permit (Highlighted are Dominion)

Owner	City/County	NOI Submittal Date	Megawatts	Acreage
	James City	9/11/2019	19.9	192
Caden Energix Wytheville LLC	Wythe	8/31/2019	20	154
Caden Energix Jarratt LLC	Greensville	8/30/2019	82.5	695
Caden Energix Axton LLC	Henry/Pittsylvania	8/29/2019	66	550
Caden Energix Gladys LLC	Campbell	8/28/2019	60	1108
Grassfield Solar, LLC	Chesapeake	7/9/2019	20	200
Rivanna Solar LLC	Albemarle	6/19/2019	12.5	150
Dogwood Solar LLC	Page	6/14/2019	20	340
Whitehorn Solar LLC	Pittsylvania	6/5/2019	50	700
Reams Solar LLC	Dinwiddie	5/15/2019	83	2000
HCE Amelia Solar I, LLC	Amelia	4/16/2019	10	60
Fountain Creek Solar LLC	Greenville	2/19/2019	80	802
Mount Nebo Solar Partners, LLC	Surry	2/6/2019	20	80
Colonial Trail W Solar, LLC	Surry	1/5/2017	150	1250
VSF Solar 2 LLC	Westmoreland	11/21/2018	11	100
Pleasant Hill Solar, LLC	City of Suffolk	11/20/2018	20	160
Caden Exergix Spout Spring LLC	Appomattox	11/14/2018	60	375
Mt. Jackson Solar II, LLC	Shenandoah	11/9/2018	19	175
Mt. Jackson Solar III, LLC	Shenandoah	11/9/2018	16.2	130
Foxhound Solar, LLC	Halifax	10/26/2018	91	1400
Children of Chesterfield Solar Power	Chesterfield	10/16/2018	20	165
Walnut Solar I, LLC	King and Queen	7/20/2017	149.9	1800
Greenwood Solar I, LLC	Culpeper	10/8/2018	100	1000
Spring Grove Solar I, LLC	Surry	11/9/2017	150	1338
Ho-Fel Solar Project	Isle of Wight	10/2/2018	38.7	292
Depot Solar	Campbell	9/21/2018	15	150
Piney Creek Solar, LLC	Halifax	9/17/2018	80	700
Loblolly Solar, LLC	Surry	9/7/2018	150	1384
VSF Solar 1 LLC	Westmoreland	8/16/2018	20	125

Waverly Solar, LLC	Sussex	7/2/2018	120.6	2000
Chesapeake Solar	Chesapeake	6/15/2018	150	920
Fort Powhatan Solar, LLC	Prince George	4/11/2018	150	2000
TPE Pamplin2 Solar	Prince Edward	1/22/2018	15.6	309
Endless Caverns Solar LLC	Rockingham	12/21/2017	31.5	243
Greensville County Solar Project, LLC	Greensville	10/4/2018	80	1225
Spring Grove Solar II, LLC	Surry	11/9/2017	150	1338
Bumblebee Solar	Campbell	11/8/2017	15	260
Culpeper North Solar, LLC	Culpeper	10/31/2017	20	296
SB Solar, LLC	Halifax	10/16/2017	10	185
Alton Post Office Solar, LLC	Halifax	10/6/2017	150	502
Crystal Hill Solar, LLC	Halifax	10/6/2017	150	629
Stagecoach Solar, LLC	Halifax	8/31/2017	15	318
Nokesville Solar LLC	Prince William	7/25/2017	20	300
Maplewood Solar I, LLC	Pittsylvania	7/20/2017	120	1200
Sycamore Solar I, LLC	Pittsylvania	7/20/2017	42	420
Westmoreland County Solar Project	Westmoreland	10/10/2018	20	161
Meherrin Solar LLC	Greensville	6/14/2017	60	840
Otter Creek Solar LLC	Mecklenburg	6/14/2017	60	690
Port Conway Solar LLC	King George	6/7/2017	20	250
Sigora Solar	Wythe	5/24/2017	40	126
OneEnergy Solidago, LLC	Isle of Wight	4/21/2017	20	160
OneEnergy Sweetspire, LLC	Hanover	4/21/2017	20	165
Halifax Solar LLC	Halifax	2/8/2017	15	125
Spout Springs Solar LLC	Appomattox	2/8/2017	20	298
Sydnor Solar Farm LLC	Mecklinburg	2/6/2017	8.8	41
Sadler Solar Project	Greensville	2/6/2019	102	1490
BM&D Ltd.	Pulaski	12/21/2016	48	320
SunPower Corporation	James City	10/25/2016	35	225
SunPower Corporation	Southhampton	10/18/2016	91	525
Turning Point Energy	Pittsylvania	4/27/2016	6	76
Ecoplexus, Inc.	Isle of Wight	3/29/2016	14	122
SunTec Solar Solutions LLC	Accomack	3/19/2016	80	500
		TOTALS:	**3,534**	**35,834**

PBR Permits Issued and Project Status (Highlighted are Dominion

Project Name	County	Permit Status	Megawatts	Acreage
Grasshopper Solar, LLC	Campbell	Permitted	80	950
Pamplin Solar, LLC	Appomattox	Permitted	16	112
Buckingham II Solar, LLC	Buckingham	Permitted	20	295
Dragonfly Solar, LLC	Campbell	Permitted	80	1,200
Twitty's Creek Solar, LLC	Charlotte	Permitted	15	100
Powells Creek Solar, LLC	Halifax	Permitted	70	710
Sunnybrook Farm, LLC	Halifax	Permitted	51	363
Water Strider Solar, LLC	Halifax	Permitted	80	1,042
Mechanicsville Solar	Hanover	Permitted	20	250
Briel Farm Solar, LLC	Henrico	Permitted	20	230
Turner Solar, LLC	Henrico	Permitted	20	463
Sol Leatherwood, LLC	Henry	Permitted	20	332
Hollyfield II Solar, LLC	King William	Permitted	13	170
Belcher Solar, LLC	Louisa	Permitted	88	1,305
Bluestone Farm Solar, LLC	Mecklenburg	Permitted	50	334
Church View Solar, LLC	Middlesex	Permitted	20	535
Sol-Madison Solar, LLC	Orange	Permitted	63	647
Danville Farm, LLC	Pittsylvania	Permitted	12	191
Rives Road Solar, LLC	Prince George	Permitted	20	147
Mt. Jackson Solar I, LLC	Shenandoah	Permitted	16	185
Southampton Solar, LLC	Southampton	Permitted	100	1,200
TWE Myrtle Solar, LLC	Suffolk	Permitted	15	135
Gardy's Mill Solar, LLC	Westmoreland	Permitted	14	363
Montross Solar	Westmoreland	Permitted	20	230
Eastern Shore Solar, LLC	Accomack	Producing Power	80	1,000
Buckingham Solar I, LLC	Buckingham	Producing Power	20	200
Hecate Energy Clarke County, LLC	Clarke	Producing Power	20	235
Essex Solar Center, LLC	Essex	Producing Power	20	275
Hollyfield Solar-Dominion Energy Services, Inc.	King William	Producing Power	17	201

Puller Solar-Dominion Energy Services, Inc.	Middlesex	Producing Power	15	170
Correctional Solar, LLC	New Kent	Producing Power	20	429
Hecate Energy Cherrydale, LLC	Northampton	Producing Power	20	236
Scott-II Solar, LLC	Powhatan	Producing Power	20	720
Sappony Solar, LLC	Sussex	Producing Power	20	371
Gloucester Solar, LLC	Gloucester	Under Construction	20	203
		TOTALS:	**1,194**	**15,529**
		PRODUCING POWER:	**152**	

Total Megawatts Currently Installed: 608
Megawatts Under Development: 5,161
TOTAL: 5,769

APPENDIX D

Dominion Energy Solar Projects in Service and Under Development

Dominion Energy's Large-Scale Solar Projects located in Virginia* (as of Oct. 25, 2019)

Facility	Locality	Category	Offtaker	Capacity in Operation (MWac)	Commercial Operations Date (COD)	Cumulative Capacity in Operation & Development* (MWac)
Amazon Solar Farm Virginia - Accomack	Accomack County	Merchant	Amazon Web Services	80	Oct-16	80
Amazon Solar Farm Virginia - Buckingham	Buckingham County	Merchant		20	Dec. 1, 2017	20
Amazon Solar Farm Virginia - New Kent	New Kent County	Merchant		20		20
Amazon Solar Farm Virginia - Scott	Powhatan County	Merchant		20		20
Amazon Solar Farm Virginia - Sappony	Sussex County	Merchant		20		20
Amazon Solar Farm Virginia - Southampton	Southampton County	Merchant		100	Dec. 15, 2017	100
Clarke	Clarke County (White Post, VA)	Merchant	Old Dominion Electric Cooperative	10	Aug-17	10
Cherrydale	Kendall Grove (Eastern Shore)	Merchant		20	Nov. 22, 2017	20
Remington	Fauquier County	Regulated	Commonwealth of VA (Energy) and Microsoft (RECs)	20	Oct. 1, 2017	20
Oceana	Virginia Beach	Regulated	Commonwealth of VA	18	Dec. 1, 2017	18
Whitehouse	Louisa County	Regulated	Serving all Dominion Energy regulated electric customers in VA and NC	20	Dec-16	20
Woodland	Isle of Wight County	Regulated		19		19
Scott	Powhatan County	Regulated		17		17
UVA Hollyfield	King William County	Regulated	UVA (Commonwealth of VA)	17	Sep-18	17
UVA Puller	Middlesex County	Regulated		15	Oct-18	15

Dominion Energy's Large-Scale Solar Projects located in Virginia* (as of Oct. 25, 2019)

Facility	Locality	Category	Offtaker	Capacity in Operation (MWac)	Commercial Operations Date (COD)	Cumulative Capacity in Operation & Development* (MWac)
Essex	Essex County (Dunnsville, VA)	PPA with Dominion Energy Virginia (Regulated)	Serving all Dominion Energy regulated electric customers in VA and NC	20	Dec. 14, 2017	20
Spring Grove 1	Surry County	Regulated	Serving all Dominion Energy regulated electric customers in VA and NC; supported by Facebook via Dominion Energy Virginia Schedule RF	0	Late 2020	98
Colonial Trail West	Surry County	Regulated		0	Late 2019	142
Water Strider	Halifax County	PPA with Dominion Energy Virginia (Regulated)	Serving all Dominion Energy regulated electric customers in VA and NC	0	Q4 2020	80
Montross	Westmoreland County	Regulated	Facebook	20	Dec-18	20
Gloucester	Gloucester County	Regulated	Facebook	20	Apr-19	20
Grasshopper	Mecklenburg County	Regulated	Facebook	0	2020	80
Sadler Solar	Greensville County	Regulated	Serving all Dominion Energy regulated electric customers in VA and NC	0	2020	100
Greensville	Greensville County	Merchant	T-Mobile USA	0	2020	80
Myrtle	City of Suffolk	Merchant	T-Mobile USA	0	2020	15
Belcher Solar	Louisa County	Regulated	Commonwealth of Virginia	0	2020	88
Bedford Solar	City of Chesapeake	Regulated	Commonwealth of Virginia	0	2021	70

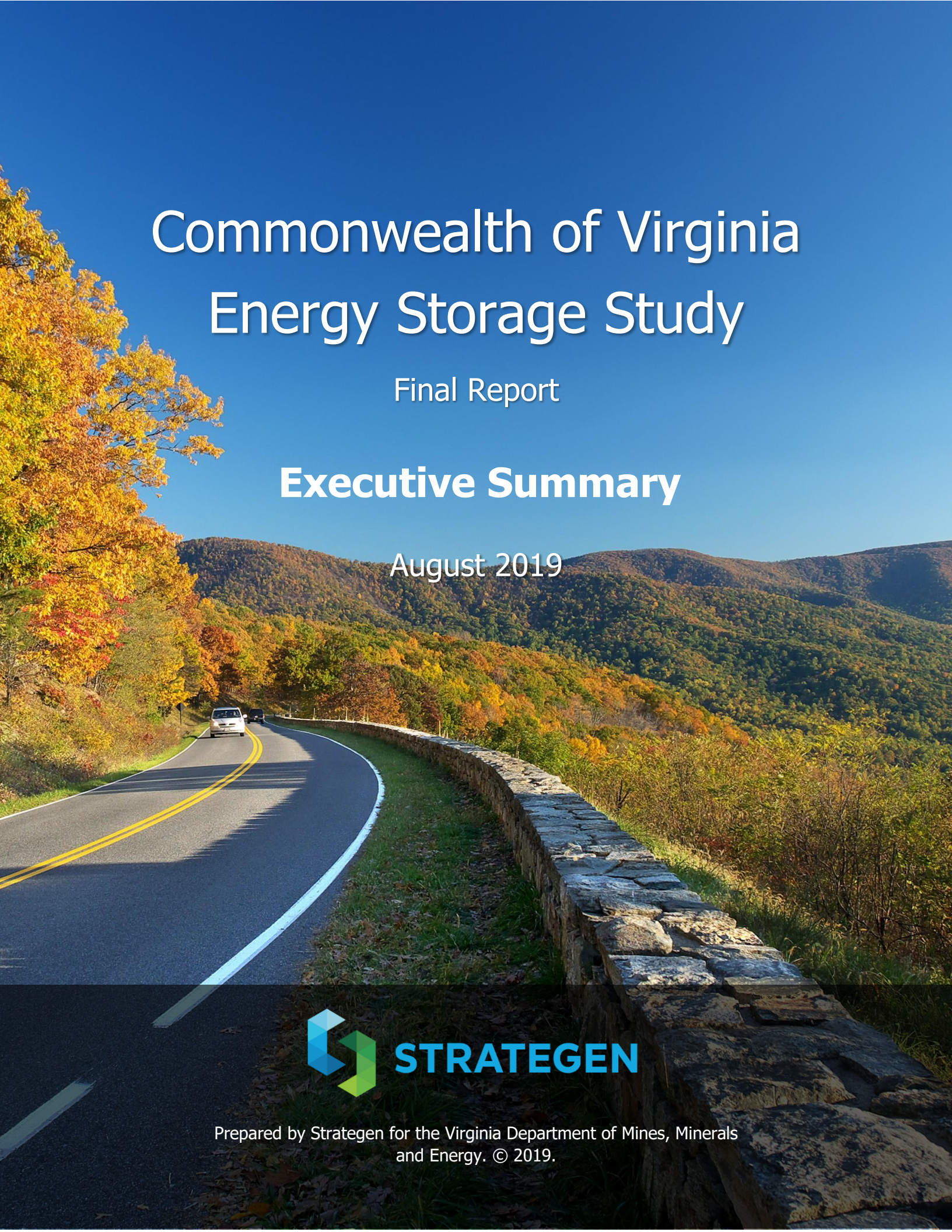
Dominion Energy's Large-Scale Solar Projects located in Virginia* (as of Oct. 25, 2019)

Facility	Locality	Category	Offtaker	Capacity in Operation (MWac)	Commercial Operations Date (COD)	Cumulative Capacity in Operation & Development* (MWac)
Walnut Solar	King and Queen County	Regulated	Commonwealth of Virginia	0	2021	90
Westmoreland Solar	Westmoreland County	PPA with Dominion Energy Virginia (Regulated)	Serving all Dominion Energy regulated electric customers in VA and NC	0	Q4 2020	20
Dulles Solar	Fairfax and Loudoun Counties	Regulated	Serving all Dominion Energy regulated electric customers in VA and NC	0	2023	100
Total*				**476**		**1,439**

*Excludes the following:
- an additional 97 MW of solar generation (project TBD) under development with Commonwealth of Virginia announced on Oct. 18, 2019;
- approximately 7.2 MW of solar distributed generation under Dominion Energy Virginia's Solar Partnership Program.

APPENDIX E

2019 Virginia Energy Storage Study
Executive Summary and Recommendations



Commonwealth of Virginia Energy Storage Study

Final Report

Executive Summary

August 2019

STRATEGEN

Executive Summary

In recent years, the market for advanced energy storage technologies has grown substantially both globally and in the U.S., primarily due to state-led initiatives such as those in New York, New Jersey, and California. An overview of the current state of energy storage technologies and markets is provided in Chapter 1: Technology and Market Overview.

With the recent passage of the Grid Transformation and Security Act, Virginia is also poised to benefit from deployment of advanced energy storage technologies. To better inform policy decisions for the Commonwealth, Strategen conducted a review of potential energy storage value streams in Virginia (Chapter 2: Energy Storage Value Streams and Use Cases in Virginia) and performed an economic analysis of the total benefits that these value streams could provide to the Commonwealth under different levels of storage deployment (Chapter 3: Analysis of Energy Storage Potential in VA).

The results of the analysis show that the near-term economic potential for energy storage in Virginia ranges from 24-113 MW (4-hr duration or less) depending on the installation costs and duration. This would yield annual net benefits ranging from $3-9 million to the Virginia electricity system and its customers. Over the next decade, the potential grows to 329-1,123 MW, with annual net benefits ranging from $20-$58 million. A preliminary estimate suggests that this equates to a total estimated job impacts 1,212-4,132 job-years, resulting in a range of 114-387 $MM in labor income.

		1hr	2hrs	4hrs	10hrs
		2019			
Low Cost	Efficient Storage Level (MW)	110	113	84	0
	Annual Net Benefits ($M)	$ 4.99	$ 9.35	$ 6.36	$ -
High Cost	Efficient Storage Level (MW)	71	72	24	0
	Annual Net Benefits ($M)	$ 2.82	$ 5.28	$ 3.18	$ -
		2029			
Low Cost	Efficient Storage Level (MW)	961	1,123	970	356
	Annual Net Benefits ($M)	$ 29.93	$ 56.66	$ 58.04	$ 25.27
High Cost	Efficient Storage Level (MW)	397	396	329	9
	Annual Net Benefits ($M)	$ 19.93	$ 37.44	$ 25.30	$ (0.17)

Figure ES-1. Summary of estimated potential electricity system benefits from energy storage deployed in the Commonwealth of Virginia. Results are summarized by High-Cost and Low-Cost scenarios for storage deployment and by duration of storage resources

These results reflect only a portion of the potential value streams that storage may be capable of providing and should therefore be considered conservative in nature.

While there are meaningful benefits to energy storage deployment, there are also a variety of market barriers that may limit these benefits from being realized under today's conditions. One key market barrier is safety and permitting issues, which are addressed in detail in Chapter 4:

Safety & Permitting Issues. Other market barriers are identified in Chapter 5, which describes ten issues that could be addressed to promote more storage adoption in Virginia.

To overcome these, Strategen recommends the state consider a set of potential policy actions, which are briefly listed below and described in more detail in Chapter 6: Recommendations & Policy Actions. These recommendations were informed by Strategen's analysis in this report and the experiences of other states around the U.S. The recommendations are intended to encourage growth in Virginia's energy storage industry and enhance resiliency, while balancing costs and economic equity concerns. While some of these recommendations may require new legislation, some could be achieved under existing law through actions taken by state agencies (e.g. DMME, DEQ) or the State Corporation Commission (SCC).

Recommendations and Policy Actions:

State Level Strategic Actions:

1. Establish a statewide storage deployment requirement to complement Virginia's existing renewable energy goals under the Grid Transformation and Security Act (i.e. 5,000 MW of wind and solar). Based on the analysis conducted in this report (see Figure ES-1), a **storage deployment target of approximately 1,000 MW by year 2030** would be consistent with an approach that maximizes net benefits for the Commonwealth.[1] In several other states, setting a storage deployment target has been a critical step for accelerating the industry's development.
2. Convene a **statewide "storage issues forum"** on a regular basis to allow key stakeholders (including the significant number of federal entities in Virginia) to identify challenges and opportunities for the industry going forward.
3. Develop a statewide **strategic plan for accelerating microgrid deployment**, which would include a significant energy storage component. Part of this deployment could include various "make ready" provisions to provide enabling microgrid infrastructure and controls networks. This can be targeted towards Virginia's significant presence of Department of Defense facilities or other critical facilities at public institutions.

Utility Planning and Procurement:

4. Move beyond the pilot stage to implement **additional commercial scale deployments** of energy storage, in addition to the 40 MW already being considered. These deployments should leverage lessons learned from the broad array of existing pilot programs across the U.S. and can advance Virginia's storage industry through "learning by doing."
5. Adopt more advanced methods and best practices for considering storage in **utility resource planning processes** (e.g. within the SCC's resource planning process) as well as **utility procurement processes** (e.g. through competitive all-resource solicitations).
6. Develop a formal **process for identifying location-specific opportunities on the distribution system for storage** to provide value to utilities and their customers –

[1] Assumes the "low-cost" scenario could be achieved by through technological advances as well as pairing storage with renewables (thus providing federal tax incentives). Based on Strategen's final review of battery storage costs estimates just prior to the release of this report (i.e. August 2019), the "low-cost" scenario appears to be more representative of large-scale standalone energy storage systems installed in the near-term.

particularly through the use of storage as a Non-Wires Alternative (NWA). This could be accomplished through an enhanced Grid Transformation Plan process, or through a separate standalone process. The process should be informed by lessons learned from other states. The process should also provide a pathway for cost recovery of storage investments. Non-wires solutions should be prioritized in the near term and secondary consideration given to hosting capacity analysis due to VA's low penetration of DERs.

7. Explore ways to support economically distressed communities by **studying the viability** of new pumped hydro projects.

Retail Rates and Customer Programs:

8. Establish ratepayer funded **direct incentive programs** to accelerate storage deployment in Virginia. Incentives can be linked to specific program goals (e.g. safety, reliability, environmental benefits), or provided as a means of accelerating market transformation (e.g. cost reduction) of the local energy storage industry. Lessons from incentive programs in California and New York can help to maximize the benefits delivered.
9. Implement **reforms to retail rates** and expand or **enhance retail customer programs** to better reflect the potential grid benefits that storage can deliver.

Wholesale Markets:

10. Enable storage "value stacking" by providing regulatory certainty through the adoption of a **Multi-Use Application (MUA) framework**. This could provide a pathway for aggregating smaller distributed storage assets for wholesale participation under FERC Order 841.
11. Participate in PJM stakeholder processes to ensure that **wholesale market rules** are continually improved to maximize storage participation options and value creation. This could include sponsorship of additional technical analysis to more closely examine PJM's "10-hour duration" rule for storage capacity market value and identify cases where shorter duration storage resources can provide enhanced value.

Interconnection and Permitting:

12. Enact revisions to codes and standards that will help enhance and streamline **safety and permitting processes** for local jurisdictions.
13. **Update the interconnection process** for distributed energy resources (DER), including those at campuses, public facilities and military installations to ensure that greater visibility and situational awareness are provided to both the local utility and wholesale market operators for resources that are providing multiple services.

Competitive Provider Participation:

14. **Revise the definition of public utility to exclude storage,** to ensure that third-party developers can continue to advance and innovate energy storage throughout the state.

Research and Development:

15. **Provide Virginia's universities with additional resources** to pursue research and development of new energy storage technologies.

APPENDIX F

Active and Withdrawn Solar Energy Projects in the PJM New Services Queue

Active Solar Energy Projects in the PJM Generation Interconnection Queue

Queue Name	Capacity (MW)	Location	Transmission Owner	Feasibility Study Status	System Impact Study Status	Facilities Study Status	Projected In Service Date
Peak Creek-Memoria Drive 12 kV	5	Pulaski	AEP	Complete	Complete	Not Required	6/1/2020
Saltville-Holston 34.5kV - Phase I	5	Smyth	AEP	Complete	Complete	Not Required	12/1/2017
Saltville-Holstone 34.5kV - Phase II	5	Smyth	AEP	Complete	Complete	Not Required	12/1/2017
Kings Dominion DP 115 kV	7	Hanover	Dominion	Complete			3/31/2021
Hopewell-Surry 230 kV	8	Surry	Dominion	Complete	Complete	In Progress	11/1/2019
Double Toll Gate 34.5kV	10	Clarke	APS	Complete	Complete	Not Required	12/31/2016
Double Tollgate 34.5kV	10	Clarke	APS	Complete	Complete	Not Required	12/31/2019
Wattsville 12 kV	11	Accomack	DPL	Complete	Complete		6/25/2021
Oak Grove 34.5 kV III	11	Westmoreland	Dominion	Complete	Complete	Not Required	6/30/2021
Hickory 34.5 kV	12	Chesapeake	Dominion	Complete	Complete	Not Required	12/31/2020
Mount Eagle 34.5kV	13	Albemarle	Dominion	Complete	Complete	Not Required	6/30/2020
Old Church 34.5kV	13	King William	Dominion	Complete	Complete	Not Required	12/31/2021
Twittys Creek 34.5 kV	14	Charlotte	Dominion	Complete	Complete	Not Required	12/31/2019
Twittys Creek 34.5kV	14	Charlotte	Dominion	Complete	Complete	Not Required	12/31/2019
Northern Neck 34.5 kV	14	Westmoreland	Dominion	Complete	Complete	Not Required	12/30/2019
Northern Neck 34.5 kV	14	Westmoreland	Dominion	In Progress			12/31/2020
Fields Crossroads 34.5 kV	15	Greensville	Dominion	In Progress			11/30/2022
Harmony Village 34.5 kV	15	Middlesex	Dominion	Complete	Complete	Not Required	12/1/2018
Kings Fork 34.5 kV	15	City of Suffolk	Dominion	Complete	Complete	Not Required	12/1/2019
Kings Fork 34.5 kV	15	City of Suffolk	Dominion	Complete	Complete	Not Required	12/1/2021
South Creek 34.5 kV	15	Appomattox	Dominion	Complete	Complete	Not Required	6/30/2021
Suffolk 34 kV	15	City of Suffolk	Dominion	Complete	Complete	In Progress	11/30/2022
Suffolk 34.5 kV	15	City of Suffolk	Dominion	In Progress			12/31/2021
Endless Caverns 34.5 kV	16	Rockingham	Dominion	Complete	Complete	Not Required	12/31/2021
Endless Caverns 34.kV	16	Rockingham	Dominion	Complete	Complete	Not Required	12/31/2021
Mt. Jackson 35kV	16	Shenandoah	Dominion	Complete	Complete	Not Required	12/31/2021
Pamplin 34.5 kV	16	Appomattox	Dominion	Complete	Complete	Not Required	12/31/2020
Fentress 34.5kV	17	Chesapeake	Dominion	Complete	Complete	Not Required	12/15/2020

Old Church 34.5kV	17	King William	Dominion	Complete	Complete	Not Required	2/15/2019
Pendleton 34.5kV	18	Virginia Beach	Dominion	Complete	Complete	Not Required	1/1/2018
Powhatan 34.5 kV	18	Powhatan	Dominion	Complete	Complete	Not Required	12/1/2023
Elko 34.5kV	19	Henrico	Dominion	Complete	Complete	Not Required	12/30/2019
Poe 34.5 kV	20	Prince George	Dominion	Complete	Complete	Not Required	12/31/2020
Brink-Trego 115kV	20	Greensville	Dominion	Complete	Complete	Complete	12/31/2020
Buckingham 34.5kV	20	Buckingham	Dominion	Complete	Not Required	Not Required	12/31/2017
Remington 34.5kV	20	Fauquier	Dominion	Complete	Not Required	Not Required	12/31/2017
Wan 34.5 kV	20	Gloucester	Dominion	Complete	Complete	Not Required	5/21/2019
Light Foot 34.5 kV	20	James City	Dominion	Complete	Complete	In Progress	10/23/2020
Sanders DP 230 kV	20	Westmoreland	Dominion	Complete	Complete	In Progress	12/15/2019
Bridge 34 kV	20	Chesterfield	Dominion	Complete	In Progress		10/31/2022
Buckingham 35kV	20	Buckingham	Dominion	Complete	Complete	Not Required	12/31/2021
Buggs Island-Chase City 115kV	20	Mecklenburg	Dominion	Complete	Complete	Complete	12/15/2020
Buggs Island-Chase City 115kV	20	Mecklenburg	Dominion	Complete	Complete	Complete	12/15/2020
Buggs Island-Chase City 115kV	20	Mecklenburg	Dominion	Complete	Complete	Complete	12/15/2020
Correctional 34.5kV	20	New Kent	Dominion	Complete	Not Required	Not Required	12/31/2017
Elko 34.5 kV	20	Henrico	Dominion	Complete	Complete	Not Required	12/30/2019
Grassfield 34.5kV	20	Chesapeake	Dominion	Complete	Not Required	Not Required	12/31/2020
Harmony Village-Shackleford 115 kV	20	Gloucester	Dominion	Complete	Complete	In Progress	12/21/2020
Harrowgate 34 kV	20	Chesterfield	Dominion	Complete	In Progress		10/31/2022
Hickory 34.5 kV	20	Chesapeake	Dominion	Complete	Complete	Not Required	12/31/2020
Kings Dominion DP 115kV	20	Hanover	Dominion	Complete			3/31/2020
Mitchell-Mountain Run 115kV	20	Culpeper	Dominion	Complete	Complete	In Progress	6/1/2019
Nokesville 35kV	20	Prince William	Dominion	Complete	Complete	Not Required	12/31/2021
North Shenandoah-Stanley 34.5 kV	20	Page	APS	Complete	Complete	Not Required	12/31/2020
Oak Grove 34.5 kV	20	Westmoreland	Dominion	Complete	Complete	Not Required	3/27/2024
Oak Grove 34.5 kV I	20	Westmoreland	Dominion	Complete	Complete	Not Required	6/30/2021
Oak Grove 34.5 kV II	20	Westmoreland	Dominion	Complete	Complete	Not Required	6/30/2021
Oak Hall	20	Accomack	DPL	Complete	Complete	Complete	10/15/2016
Oak Hall	20	Accomack	DPL	Complete	Complete	Complete	12/30/2016
Oak Hall	20	Accomack	DPL	Complete	Complete	Complete	12/30/2017

Oak Hall	20	Accomack	DPL	Complete	Complete	Complete	12/30/2017
Old Church 34.5 KV	20	Hanover	Dominion	Complete	Complete	Complete	6/1/2020
Peak Creek-Draper 34.5 kV	20	Pulaski	AEP	In Progress			6/1/2020
Perth-Hickory Grove 115kV	20	Halifax	Dominion	Complete	Complete	Complete	12/31/2021
Poolesville 34 kV	20	Surry	Dominion	In Progress			12/31/2020
Poolesville 34.5 kV	20	Surry	Dominion	Complete	In Progress		6/18/2021
Poolesville 34.5 kV	20	Surry	Dominion	Complete	In Progress		6/18/2021
Poolesville 34.5 kV	20	Surry	Dominion	Complete	In Progress		6/18/2021
Powhatan 34.5kV	20	Powhatan	Dominion	Complete	Not Required	Not Required	12/31/2017
Sapony 34.5kV	20	Sussex	Dominion	Complete	Not Required	Not Required	12/31/2017
Shockoe 69 kV	20	Pittsylvania	Dominion	Complete	In Progress		7/31/2020
Smith Mountain-Candler's Mountain 138kV	20	Campbell	AEP	Complete	Complete	In Progress	6/1/2019
Smithfield 34.5 kV	20	Isle of Wight	Dominion	Complete	Complete	Not Required	9/30/2020
Stockton 34.5kV	20	Henry	AEP	Complete	Complete	Not Required	12/31/2019
Suffolk 34 kV	20	City of Suffolk	Dominion	Complete	Complete	In Progress	11/30/2022
Tyler 34 kv	20	Chesterfield	Dominion	Complete	In Progress		10/31/2022
Tyler 34.5 kV	20	Chesterfield	Dominion	In Progress			11/30/2022
Wallops Island 69 kV	20	Accomack	ODEC	Complete	In Progress		12/1/2020
Weirwood-Eastville 69kV	20	Northampton	ODEC	Complete	Complete	Not Required	4/1/2017
Welco 34.5 kV	20	Halifax	Dominion	In Progress			12/1/2021
Westmoreland 34.5kV	20	Westmoreland	Dominion	Complete	Complete	Not Required	2/15/2019
Winterpock 34.5 kV	20	Chesterfield	Dominion	Complete	Complete	Not Required	12/1/2023
Old Church 34.5 kV	25	Hanover	Dominion	Complete	Complete	In Progress	12/11/2019
Halifax-Person 230kV	29	Halifax	Dominion	Complete	Complete	In Progress	9/30/2018
Brink-Trego 115kV	40	Greensville	Dominion	Complete	Complete	Complete	12/31/2020
Altavista-Mt. Airy 69kV	42	Pittsylvania	Dominion	Complete	Complete	In Progress	10/1/2019
Crystal Hill-Halifax 115kV	45	Halifax	Dominion	Complete	Complete	In Progress	9/30/2018
Beechwood DP-Palmer Springs 115 kV	45	Mecklenburg	Dominion	Complete	Complete	In Progress	12/1/2019
Chase City 115 kV	50	Mecklenburg	Dominion	Complete	In Progress		6/1/2020
Chase City 115kV	50	Mecklenburg	Dominion	Complete	Complete	Complete	9/1/2020
Gretna DP 69 kV	50	Pittsylvania	Dominion	Complete	Complete	Complete	12/18/2020
Gretna DP-Shockoe DP 69 kV	50	Mecklenburg	Dominion	In Progress			12/15/2020

Grottoes-Merck 115kV	50	Rockingham	Dominion	Complete	In Progress		12/30/2022
Halifax-Person 230kV	50	Halifax	Dominion	Complete	Complete	In Progress	3/7/2019
Harmony Village-Shackleford 115 kV	50	Gloucester	Dominion	Complete	Complete	In Progress	12/23/2019
Harmony Village-Shackleford 115kV	50	King and Queen	Dominion	Complete	Complete	Complete	12/31/2022
Holland-Union Camp 115 kV	50	Isle of Wight	Dominion	Complete	Complete	In Progress	4/1/2021
Jeterville-Ponton 115 kV	50	Amelia	Dominion	In Progress			12/1/2022
Kings Dominion DP 115 kV	50	Caroline	Dominion	In Progress			12/16/2022
Ridgeway-Solite 69 kV	50	Henry	AEP	In Progress			12/15/2021
St. Johns 115 kV	50	Caroline	Dominion	Complete	In Progress		12/1/2022
Waverly #2 DP 115kV	50	Sussex	Dominion	Complete	Complete	Complete	12/31/2020
Halifax-Mt. Laurel 115kV	51	Halifax	Dominion	Complete	Complete	Complete	7/15/2022
Myrtle-Windsor DP 115kV	51	Isle of Wight	Dominion	Complete	Complete	In Progress	11/30/2021
Suffolk 115 kV	51	City of Suffolk	Dominion	Complete	In Progress		11/30/2021
Hopewell-Surry 230 kV	52	Surry	Dominion	Complete	Complete	In Progress	9/30/2019
E. Danville-Roxborough 230 kV	54	Pittsylvania	AEP	Complete	In Progress		6/1/2020
Scottsville-Colleen 138 kV	55	Albemarle	AEP	In Progress			12/12/2022
Stonewall-Long Mountain 69 kV	55	Appomattox	AEP	Complete	In Progress		12/31/2020
Brink-Trego 115kV	60	Greensville	Dominion	Complete	Complete	Complete	12/31/2020
Brandy-Remington 115kV	60	Culpeper	Dominion	Complete	Complete	In Progress	6/30/2018
Disputanta-Waverly 115kV	60	Prince George	Dominion	Complete	Complete	In Progress	12/31/2019
Gladys DP-Stonemill Switching Station 69 kV	60	Campbell	Dominion	Complete	In Progress		9/1/2020
Mitchell-Mountain Run 115kV	60	Culpeper	Dominion	Complete	Complete	In Progress	6/1/2019
Perth-Hickory Grove 115kV	60	Halifax	Dominion	Complete	Complete	Complete	12/31/2021
Poolesville 230 kV	60	Surry	Dominion	In Progress			12/1/2021
Red House-South Creek 115 kV	60	Appomattox	Dominion	Complete	Complete	In Progress	12/15/2020
Sewellton Jct-Webbs Crossroads 69 kV	60	Russell	EKPC	In Progress			12/31/2021
Shockoe DP-Chatham 69 kV	60	Pittsylvania	Dominion	Complete	In Progress		9/1/2020
Smith Mountain-Candler's Mountain 138kV	60	Campbell	AEP	Complete	Complete	In Progress	6/1/2019
Gladys-Stone Mill 69 kV	60	Campbell	Dominion	Complete	In Progress		9/30/2021
Locust Grove-Paytes 115 kV	63	Orange	Dominion	Complete	Complete	Not Required	12/30/2021
Locust Grove-Paytes 115kV	63	Orange	Dominion	Complete	Complete	Complete	4/30/2018
Crystal Hill-Halifax 115 kV	65	Halifax	Dominion	Complete	Complete	In Progress	1/31/2019

Crystal Hill 115 kV	66	Halifax	Dominion	Complete	Complete	In Progress	1/31/2019
Axton 138 kV	66	Henry	AEP	Complete	In Progress		12/15/2021
Bakers Pond-Ivor 115kV	68	Sussex	Dominion	Complete	Complete	In Progress	12/31/2019
Waverly-Wakefield 115 kV	68	Sussex	Dominion	In Progress			6/30/2022
Bartonsville-Meadow Brook 138 kV	70	Frederick	APS	Complete	In Progress		12/1/2022
Belle Haven-Tasley 69 kV	70	Accomack	ODEC	Complete	In Progress		11/30/2021
Elk Run D.P.-Gainesville 230 kV	70	Fauquier	Dominion	Complete	In Progress		11/30/2021
Fentress-Landstown 230 kV	70	Chesapeake	Dominion	Complete	Complete	In Progress	12/31/2020
Handsome-Southampton 115kV	70	Southampton	Dominion	Complete	In Progress		12/31/2020
Harmony Village-Shackleford 115kV	70	King and Queen	Dominion	Complete	Complete	Complete	12/31/2022
Reams 115 kV	70	Dinwiddie	Dominion	Complete	Complete	In Progress	12/31/2021
Sedge Hill-Person 230 kV	70	Halifax	Dominion	Complete	Complete	In Progress	3/7/2020
Clover-Sedge Hill 230 kV	71	Halifax	Dominion	Complete	Complete	In Progress	9/2/2019
Myrtle-Windsor 115 kV	71	Isle of Wight	Dominion	Complete			11/30/2021
Suffolk 115 kV	71	City of Suffolk	Dominion	In Progress			11/30/2021
Harrisburg-Endless Caverns 230 kV	73	Rockingham	Dominion	In Progress			12/31/2021
Bakers Pond-Bell Ave 115 kV	75	Sussex	Dominion	Complete	Complete	In Progress	6/1/2022
Jacksons Ferry 138kV	75	Wythe	AEP	Complete	Complete	In Progress	12/31/2021
Meadow Brook-Strasburg 138 kV	75	Frederick	APS	Complete	Complete	In Progress	12/31/2020
Halifax-Person 230 kV	75	Halifax	Dominion	Complete	Complete	In Progress	9/30/2018
Kings Dominion DP 115 kV	77	King William	Dominion	Complete	Complete	In Progress	12/31/2019
Boydton DP-Kerr Dam 115 kV	80	Mecklenburg	Dominion	Complete	In Progress		6/1/2021
Brink 115 kV	80	Greensville	Dominion	Complete	In Progress		12/1/2018
Brink 115kV	80	Greensville	Dominion	Complete	Complete	Complete	3/31/2020
Chase City-Lunenburg 115kV	80	Mecklenburg	Dominion	Complete	Complete	Complete	5/15/2020
Clover-Sedge Hill 230 kV	80	Halifax	Dominion	Complete	Complete	In Progress	12/31/2020
Elmont 115kV	80	Hanover	Dominion	Complete	Complete	In Progress	12/31/2020
Emporia-Trego 115kV	80	Greensville	Dominion	Complete	Complete	Complete	12/31/2020
Harmony Village-Shackleford 115 kV	80	Gloucester	Dominion	Complete	Complete	In Progress	12/21/2020
Mitchell DP 115kV	80	Culpeper	Dominion	Complete	Complete	In Progress	6/30/2019
Reams 115kV	80	Dinwiddie	Dominion	Complete	Complete	Complete	12/31/2021
Purdy Sw.-Reams 115 kV	83	Greensville	Dominion	Complete	In Progress		9/30/2021

Barterbrook-Stuarts Draft 115 kV	83	Augusta	Dominion	Complete	Complete	In Progress	11/13/2020
Meads Store 138 kV	83	Bedford	AEP	Complete			11/30/2020
Ivor-Oakridge 115kV	85	Isle of Wight	Dominion	Complete	Complete	In Progress	12/31/2019
Garner DP-Lancaster 115 kV	86	Lancaster	Dominion	Complete	Complete	In Progress	11/30/2021
Louisa-South Anna 230kV	88	Louisa	Dominion	Complete	Complete	Complete	12/1/2020
Harmony Village-Shackleford 115 kV	90	King and Queen	Dominion	Complete	Complete	Complete	12/31/2022
Kerr Dam-Ridge Rd 115 kV	90	Mecklenburg	Dominion	Complete	In Progress		12/1/2021
Stockton 138 kV	90	Henry	AEP	In Progress			12/31/2022
Clover-Sedge Hill 230kV	91	Halifax	Dominion	Complete	In Progress		9/2/2019
Franklin 115kV	91	Southampton	Dominion	Complete	Complete	Complete	12/31/2021
Myrtle-Windsor 115 kV	91	Isle of Wight	Dominion	In Progress			11/30/2021
Mt. Airy-Wythe 138 kV	95	Wythe	AEP	Complete	In Progress		12/31/2022
East Danville-Roxborough 230 kV	96	Pittsylvania	AEP	Complete	In Progress		6/1/2020
Hopewell-Surry 230kV	98	Surry	Dominion	Complete	Complete	In Progress	9/30/2019
Bremo-Powhatan 230kV	100	Powhatan	Dominion	Complete	Complete	In Progress	10/1/2019
Boykins-Handsome 115kV	100	Washington	Dominion	Complete	Complete	Complete	12/1/2017
Brodnax-South Hill 115 kV	100	Mecklenburg	Dominion	In Progress			10/31/2021
Clover-Rawlings 500 kV	100	Charlotte	Dominion	In Progress			7/1/2022
Clubhouse-Lakeview 230kV	100	Greensville	Dominion	Complete	Complete	Complete	12/1/2021
Curdsville-Willis Mtn 115 kV	100	Buckingham	Dominion	Complete	In Progress		9/15/2021
Disputanta-Poe 115 kV	100	Prince George	Dominion	Complete	Complete	In Progress	12/1/2021
Morgans Cut-Glen Lyn 138kV	100	Pulaski	AEP	Complete	In Progress		11/1/2020
Mountain Run-Mitchell 115 kV	100	Culpeper	Dominion	Complete	Complete	In Progress	10/1/2019
Oak Grove-Dahlgren 230 kV	100	King George	Dominion	In Progress			11/30/2021
Page-Bethel 138 kV	100	Page	APS	Complete	Complete	In Progress	12/31/2019
Pleasant Hill-Trego 115kV	100	Greensville	Dominion	In Progress	In Progress		9/30/2020
Shelhorn-Yardly Ridge 230kV	100	Loudoun	Dominion	In Progress			6/1/2023
Smith Mountain-Bearskin 138kV	100	Pittsylvania	AEP	Complete	Complete	In Progress	10/21/2017
Wakefield–Waverly 115 kV	100	Sussex	Dominion	Complete	In Progress		12/31/2021
Grit DP-Perth 115 kV	102	Pittsylvania	Dominion	Complete	In Progress		4/1/2021
Rockcastle 138 kV	102	Bedford	AEP	Complete	In Progress		5/3/2021
Biery-Clover 230 kV	105	Mecklenburg	Dominion	Complete	Complete	In Progress	9/2/2019

Louisa-South Anna 230 kV	105	Louisa	Dominion	Complete	Complete	In Progress	10/30/2020
Harmony Village-Shackleford 115 kV	110	King and Queen	Dominion	Complete	Complete	In Progress	10/1/2019
Fredericksburg-Pinewood 115 kV	120	Caroline	Dominion	Complete	Complete	In Progress	12/1/2021
Harrowgate-Locks 115kV	120	Chesterfield	Dominion	Complete	In Progress		12/1/2022
Ladysmith CT-St. Johns 230 kV	120	Caroline	Dominion	Complete	Complete	In Progress	12/1/2021
Ladysmith CT-St. Johns 230 kV	120	Caroline	Dominion	Complete	Complete	In Progress	12/1/2021
Smith Mountain-Bearskin 138 kV	120	Pittsylvania	AEP	Complete	Complete	In Progress	10/1/2019
Wurno 138kV	120	Pulaski	AEP	Complete	In Progress		6/1/2021
Briery-Clover 230 kV	122	Mecklenburg	Dominion	Complete	In Progress		3/1/2021
Berry Hill 138 kV	125	Pittsylvania	AEP	In Progress			11/25/2022
Garner-Northern Neck 115 kV	127	City of Richmond	Dominion	Complete	Complete	In Progress	10/23/2020
Grit DP-Perth 115 kV	127	Campbell	Dominion	Complete	In Progress		4/1/2021
Chase City-Lunenburg 115 kV	130	Lunenburg	Dominion	Complete	Complete	In Progress	10/31/2020
Harmony Village-Shackleford 115 kV	130	King and Queen	Dominion	Complete	In Progress		10/1/2019
Garner DP-Lancaster 115 kV	131	Lancaster	Dominion	In Progress			11/30/2021
Kidds Store-Sherwood 115 kV	138	Albemarle	Dominion	Complete	In Progress		3/1/2022
Hopewell-Surry 230kV	142	Surry	Dominion	Complete	Complete	Complete	12/1/2019
Claytor Lake-Edgemont 138 kV	149	Montgomery	AEP	In Progress			12/31/2022
Clubhouse-Sappony 230 kV	149	Sussex	Dominion	Complete	In Progress		12/31/2021
Louisa PS-South Anna PS 230 kV	149	Louisa	Dominion	In Progress			12/31/2022
Remington-Gordonsville 230 kV	149	Culpeper	Dominion	Complete	Complete	In Progress	10/23/2020
Central-Chase City 115kV	150	Charlotte	Dominion	Complete	Complete	In Progress	3/31/2021
Harmony Village-Shackleford 115 kV	150	King and Queen	Dominion	In Progress			10/1/2019
Bell Avenue 115 kV	150	Southampton	Dominion	Complete	In Progress		9/30/2021
Carson-Septa 500 kV	150	Sussex	Dominion	Complete	In Progress		9/15/2021
Grassfield-Great Bridge 115kV	150	City of Chesapeake	Dominion	Complete	Complete	In Progress	12/31/2019
Hayes-Whitemarsh 115 kV	150	Gloucester	Dominion	In Progress			12/31/2021
Hopewell-Surry 230 kV	150	Surry	Dominion	Complete	Complete	In Progress	9/30/2019
Hopewell-Surry 230 kV	150	Surry	Dominion	Complete	Complete	In Progress	12/31/2020
Hopewell-Surry 230 kV	150	Surry	Dominion	Complete	In Progress		9/29/2021
Louisa-South Anna 230 kV	150	Louisa	Dominion	In Progress			11/1/2021
Mountain Run-Mitchell 115 kV	150	Culpeper	Dominion	Complete	Complete	In Progress	10/2/2019

Smith Mountain-E. Danville 138 kV	150	Pittsylvania	AEP	Complete			9/30/2021
Stuarts Draft-Waynesboro 115kV	150	Augusta	Dominion	Complete	Complete	In Progress	10/31/2018
Victoria-Martin 115 kV	150	Nottoway	Dominion	Complete	In Progress		9/1/2021
Bremo-Scottsville 138 kV	153	Buckingham	AEP	Complete	In Progress		8/31/2021
Hopewell-Surry 230kV	160	Prince George	Dominion	Complete	Complete	Complete	5/15/2021
Kings Dominion DP 115 kV	160	Caroline	Dominion	In Progress			12/31/2022
Clubhouse 230 kV	200	Greensville	Dominion	Complete	In Progress		6/30/2020
Morrisville 230 kV	200	Fauquier	Dominion	Complete	Complete	In Progress	11/2/2020
Axton-Danville 138 kV	201	Henry	AEP	In Progress			5/31/2022
Septa 500kV	240	Isle of Wight	Dominion	Complete	Complete	In Progress	10/1/2019
Septa 500kV	240	Isle of Wight	Dominion	Complete	Complete	In Progress	10/1/2019
Four Rivers-Hanover 230 kV	285	Hanover	Dominion	Complete	Complete	In Progress	12/31/2022
Carson-Rawlings 500 kV	290	Sussex	Dominion	Complete	In Progress		12/31/2021
Carson-Rogers Road 500 kV	300	Sussex	Dominion	Complete	In Progress		6/1/2022
Carson-Rawlings 500 kV	314	Dinwiddie	Dominion	Complete			9/15/2022
Chickahominy 230kV	320	Charles City	Dominion	Complete	Complete	In Progress	10/1/2019
Carson-Rogers Rd 500 kV	394	Sussex	Dominion	In Progress			6/1/2022
Carson-Rogers Road 500 kV	400	Greensville	Dominion	Complete	Complete	In Progress	12/1/2021
Carson-Rogers Rd 500 kV	500	Greensville	Dominion	Complete	Complete	In Progress	12/1/2021
Spotsylvania 500kV	500	Spotsylvania	Dominion	Complete	Complete	Complete	12/31/2022
Carson-Suffolk 500 kV	800	Sussex	Dominion	Complete	Complete	In Progress	12/31/2021
Total Megawatts:	**19,523**						
MW Increase from 2018 Report:	**5,423**						

Solar Energy Projects Withdrawn from the PJM New Services Queue

Queue Name	Capacity (MW)	Location	Transmission Owner
Arnold's Corner 34.5kV	18	King George	Dominion
Axton 138 kV	68	Henry	AEP
Baker Pont-Ivor 115 kV	85	Southampton	Dominion
Bakers Pond-Ivor 115kV	85	Southampton	Dominion
Banister 34.5kV	20	Pittsylvania	Dominion
Battle Town 115kV	100	Clarke	APS
Bayview	20	Northampton	ODEC
Bayview	20	Northampton	ODEC
Beechwood DP-Palmer Springs 115 kV	20	Mecklenburg	Dominion
Boykin 115kV	20	Unknown	Dominion
Boykins 115 kV	100	City of Portsmouth	Dominion
Boykins 115kV	60	Southampton	Dominion
Boykins 34.5kV	20	Southampton	Dominion
Boykins 34.5kV	8.5	Southampton	Dominion
Boykins 34.5kV	13	Southampton	Dominion
Boykins 34.5kV	20	Southampton	Dominion
Boykins-Murphy 115kV	50	Southampton	Dominion
Brandy DP 115 kV	5	Culpeper	Dominion
Brandy DP-Remington 115 kV	60	Fauquier	Dominion
Bremo-Cunningham DP 115 kV	20	Fluvanna	Dominion
Bremo-Kidds Store 115 kV	75	Fluvanna	Dominion
Briery DP-Clover 230 kV	100	Prince Edward	Dominion
Briery-Clover 230 kV	144	Mecklenburg	Dominion
Briery-Clover 230kV	240	Prince Edward	Dominion

Brunswick 115 kV	130	Brunswick	Dominion
Buckhorn-Lonesome Pine 138kV	100	Tazewell	AEP
Carson-Clover 500 kV	180	Dinwiddie	Dominion
Carson-Rodgers Road 500 kV	500	Greensville	Dominion
Carson-Rogers Rd 500 kV	94	Sussex	Dominion
Carson-Septa 500 kV	400	Sussex	Dominion
Catoctin 138kV	20	Frederick	APS
Charles City	20	Henrico	Dominion
Chase City 115kV	49.9	Mecklenburg	Dominion
Chase City 34.5kV	36	Mecklenburg	Dominion
Chase City-Kerr Dam 115kV	49	Mecklenburg	Dominion
Chase-City-Twittys Creek 115kV	100	Mecklenburg	Dominion
Chatham 69kV	15	Pittsylvania	Dominion
Chickahominy 230 kV	570	Charles City	Dominion
Chickahominy 34.5kV	20	Unknown	Dominion
Clover	7	Halifax	Dominion
Clubhouse 230 kV	200	Greensville	Dominion
Clubhouse 230kV	85	Greensville	Dominion
Clubhouse-Freeman 115kV	40	Greensville	Dominion
Clubhouse-Freeman 115kV	40	Greensville	Dominion
Clubhouse-Freeman DP 115 kV	250	Greensville	Dominion
Clubhouse-Lakeville 230 kV	72.3	Greensville	Dominion
Coleen-Clifford 138 kV	100	Nelson	AEP
Crittenden 34.5kV	10	Isle of Wight	Dominion
Culpeper 34.5 kV	20	Culpeper	Dominion
Culpeper 34.5kV	15	Culpeper	Dominion
Culpeper 34.5kV	15	Unknown	Dominion
Culpeper 34.5kV	20	Culpeper	Dominion
Culpeper 34.5kV	20	Culpeper	Dominion
Culpeper 35kV	20	Culpeper	Dominion
Curdsville-Willis Mountain 115 kV	100	Buckingham	Dominion

Double Toll Gate 138kV	20	Clarke	APS
Double Toll Gate 34.5kV	20	Clarke	APS
East Lima-South Kenton 138kV	20	Unknown	DPL
Emmitsburg–Taneytown 2 34.5 kV	13.8	Frederick	APS
Emporia-Trego 115kV	80	Greensville	Dominion
Endless Caverns 34.5 kV	20	Rockingham	Dominion
Fentress 34.5kV	15	City of Chesapeake	Dominion
Garner-Lancaster 115kV	100	Lancaster	Dominion
Gordonsville-Remington 230kV	100	Culpeper	Dominion
Gordonsville-Remington 230kV	150	Culpeper	Dominion
Grassfield 13.2kV	20	City of Chesapeake	Dominion
Gretna DP 69 kV	50	Mecklenburg	Dominion
Handsome 115kV	75	Southampton	Dominion
Handsome DP-Southampton 115kV	130	Southampton	Dominion
Harmony Village 34 kV	15	Middlesex	Dominion
Harmony Village 35kV	20	Middlesex	Dominion
Harmony Village-Dunnsville 34.5kV	17.5	Middlesex	Dominion
Harrisonburg-Stauton 115kV	20	Rockingham	Dominion
Harrowgate-Locks 115 kV	120	Chesterfield	Dominion
Hickman-Riverbend 69kV	50	Pulaski	AEP
Hickory 34.5 kV	12	City of Chesapeake	Dominion
Hickory 34.5 kV	20	City of Chesapeake	Dominion
Hickory 34.5 kV	12	City of Chesapeake	Dominion
Hickory 34.5kV	20	City of Chesapeake	Dominion
Hickory 34.5kV	20	City of Chesapeake	Dominion
Hopewell-Surry 230kV	80	Prince George	Dominion
Indian River-Nelson 138kV	80	Sussex	DPL
King's Fork 34.5kV	15	City of Suffolk	Dominion
Klockner 34.5 kV	18.2	Wythe	AEP
Louisa 34.5kV	20	Louisa	Dominion
Louisa-North Anna 230kV	99.9	Louisa	Dominion

Louisa-South Anna 230 kV	80	Louisa	Dominion
Louisa-South Anna 230kV	150	Louisa	Dominion
Lynbrook 12 kV	10	Campbell	AEP
Morgan's Cut 34.5kV	60	Pulaski	AEP
Morrisville 230 kV	150	Accomack	Dominion
Morrisville 230 kV	200	Fauquier	Dominion
Morrisville 230 kV	200	Fauquier	Dominion
Mount Eagle 34.5 kV	11	Albemarle	Dominion
Mountain Run 115 kV	20	Culpeper	APS
Mt. Airy 34.5kV	50	Wythe	AEP
Mt. Jackson 34.5 kV	18.9	Shenandoah	Dominion
Myrtle-Windsor 115kV	50	Isle of Wight	Dominion
Old Chapel-Millville 138kV	20	City of Chesapeake	Dominion
Old Church 34.5kV	5	Hanover	Dominion
Old Church 34.5kV	20	Hanover	Dominion
Pamplin 34.5kV	15	Prince Edward	Dominion
Paytes 115 kV	20	Orange	Dominion
Perth 115kV	100	Halifax	Dominion
Poolesville 230 kV	60	Surry	Dominion
Remington-Gainesville 230kV	85	Fauquier	Dominion
Ridgeway-Dan River 69kV	20	Pittsylvania	AEP
Saddler 115kV	100	Southampton	Dominion
Sapony 230 kV	74.9	Sussex	Dominion
Smithfield 34.5kV	20	Isle of Wight	Dominion
Smithfield-Surry 230kV	160	Isle of Wight	Dominion
South Creek 115 kV	62	Appomattox	Dominion
Spotsylvania 500 kV	556	Spotsylvania	Dominion
Spotsylvania 500 kV	800	Spotsylvania	Dominion
St. Johns 115kV	14.9	Carolina	Dominion
Standardsville-Pratts 34.5 kV	17	Greene	APS
Stockton-Axton 34.5 kV	20	Henry	AEP

Stuarts Draft 23kV	20	Augusta	Dominion
Suffolk-Poe 115 kV	100	Isle of Wight	Dominion
Tasley	5	Accomack	ODEC
Tasley 69kV	10	Accomack	ODEC
Tasley 69kV	20	Accomack	ODEC
Tasley 69kV	9	Accomack	ODEC
Tasley-Kellam 69kV	20	Accomack	ODEC
Tasley-Kellam 69kV	20	Accomack	ODEC
Tasley-Kellam 69kV	20	Accomack	ODEC
Tasley-Oak Hall 69kV I	20	Accomack	ODEC
Tasley-Oak Hall 69kV II	20	Accomack	ODEC
Turner 34.5 kV	20	Henrico	Dominion
Unionville 115kV	20	Orange	Dominion
Unionville 12.5kV	10	Orange	Dominion
Wakefield 12.5kV	20	Sussex	Dominion
Wakefield 34.5kV	10	Surry	Dominion
Wakefield 34.5kV	10	Surry	Dominion
Watkins Corner 34.5kV	20	Southampton	Dominion
Wattsville-Wallops Island 69kV	20	Accomack	ODEC
Welco 34.5 kV	10	Halifax	Dominion
Westmoreland 34.5kV	20	Westmoreland	Dominion
Wurno I 34.5KV	20	Pulaski	AEP
Wurno II 34.5kV	20	Pulaski	AEP
Total Withdrawn from PJM Queue:	**9,757**		
MW Increase from 2018 Report:	**2,615**		

APPENDIX G

Active and Withdrawn Energy Storage Projects in the PJM New Services Queue

Energy Storage Projects in the PJM Generation Interconnection Queue

Queue Name – Names in Blue are Solar and Storage	Capacity (MW)	Location	Status	Transmission Owner	Feasibility Study Status	System Impact Study Status	Facilities Study Status	Projected In Service Date
Beechwood-Palmer Springs 115 kV	45	Mecklenburg	Active	Dominion	Complete	Complete	In Progress	12/1/2019
Wallops Island 69 kV	20	Accomack	Active	ODEC	Complete	In Progress		12/1/2020
Bell Avenue 115 kV	150	Southampton	Active	Dominion	Complete	In Progress		9/30/2021
Reams 115 kV	70	Dinwiddie	Active	Dominion	Complete	Complete	In Progress	12/31/2021
Smith Mountain-E. Danville 138 kV	150	Pittsylvania	Active	AEP	Complete			9/30/2021
Carson-Rogers Road 500 kV	300	Sussex	Active	Dominion	Complete	In Progress		6/1/2022
Clubhouse 230 kV	200	Greensville	Active	Dominion	Complete	In Progress		6/30/2020
Hopewell-Surry 230 kV	150	Surry	Active	Dominion	Complete	In Progress		9/29/2021
Brodnax-South Hill 115 kV	100	Mecklenburg	Active	Dominion	In Progress			10/31/2021
Carson-Rogers Rd 500 kV	394	Sussex	Active	Dominion	In Progress			6/1/2022
Hayes-Whitemarsh 115 kV	150	Gloucester	Active	Dominion	In Progress			12/31/2021
Light Foot 34.5 kV	5	James City	Active	Dominion	Complete	Complete	In Progress	10/23/2020
New Road 115kV	170	Loudoun	Active	Dominion	Complete	In Progress		11/30/2020
Sapony 34.5 kV	17.6	Sussex	Active	Dominion	Complete			6/1/2021
Harmony Village 230 kV	40	Middlesex	Active	Dominion	Complete	In Progress		11/30/2020
Disputanta-Poe 115 kV	20	Prince George	Active	Dominion	Complete			9/15/2021
Kerr Dam-Ridge Road 115 kV	20	Mecklenburg	Active	Dominion	Complete	In Progress		9/15/2021
Bakers Pond-Bell Ave 115 kV	75	Sussex	Active	Dominion	Complete			6/1/2022
Yadkin 115 kV	100	Chesapeake	Active	Dominion	Complete	In Progress		12/1/2021
Mitchell DP-Mountain Run 115 kV	40	Culpeper	Active	Dominion	Complete	In Progress		12/31/2020
Jacksons Ferry 138 kV	127.2	Wythe	Active	AEP	In Progress			12/1/2022
Harmony Village 230 kV	80	Middlesex	Active	Dominion	In Progress			11/30/2020
Endless Caverns 115 kV	200	Rockingham	Active	Dominion	In Progress			10/31/2023
New Road 230 kV	300	Loudoun	Active	Dominion	In Progress			11/30/2021
Bakers Pond-Bell Ave 115 kV II	75	Sussex	Active	Dominion	In Progress			6/1/2022
New Church 138 kV	19	Accomack	Active	DPL	In Progress			12/31/2022
Taskey 25 kV	5	Accomack	Active	ODEC	In Progress			6/30/2020
Four Rivers-Hanover 230 kV	450	Hanover	Active	Dominion	In Progress			12/31/2022

Clubhouse-Sapony 230 kV	223.5	Dinwiddie	Active	Dominion	In Progress			12/31/2022
Shockoe 69 kV	20	Pittsylvania	Active	Dominion	Complete	In Progress		7/31/2020
Byllesby 69 kV	4	Carroll	In Service	AEP	Complete	Complete		12/31/2018
Newport News 23kV	10	Newport News	Engineering & Procurement	Dominion	Complete	Complete		4/30/2021
Total Storage Megawatts:	**3,730**							
MW Increase from 2018 Report:	**2,996**							

Energy Storage Projects Withdrawn from the PJM Generation Interconnection Queue

Queue Name - Names in Blue are Solar and Storage	Capacity (MW)	Location	Status	Transmission Owner	Feasibility Study Status	System Impact Study Status	Facilities Study Status	Projected In Service Date
Gosport 34.5 kV	21.5	City of Portsmouth	Withdrawn	Dominion	Withdrawn			10/16/2020
Clubhouse 230 kV	200	Greensville	Withdrawn	Dominion	Complete			6/30/2019
Carson-Rogers Rd 500 kV	94	Sussex	Withdrawn	Dominion	Complete			6/1/2022
Kellam - Bayview 69kV	20	Northampton	Withdrawn	ODEC	Complete	Withdrawn		12/31/2013
Glen Lyn	10	Giles	Withdrawn	AEP	Complete	Complete	Withdrawn	10/1/2016
New Church 138kV	20	Accomack	Withdrawn	DPL	Complete	Complete	Withdrawn	12/31/2016
Tasley 25kV	4	Accomack	Withdrawn	DPL	Complete	Complete	In Progress	12/1/2016
Stuarts Draft-Waynesboro 115 kV	150	Augusta	Withdrawn	Dominion	Complete			10/31/2018
Locust Grove-Paytes 115 kV	95.5	Orange	Withdrawn	Dominion	Complete			9/30/2021
Clubhouse 230kV	85	Greensville	Withdrawn	Dominion	Complete	Complete		10/1/2019
Columbia 115kV	2	Louisa	Suspended	Dominion				3/31/2017
Total Storage Withdrawn	**702**							
MW Increase from 2018 Report:	**390**							

APPENDIX H

Virginia Solar Energy Development and Energy Storage Authority Bylaws

Virginia Solar Energy Development and Energy Storage Authority Bylaws

ARTICLE I. APPLICABILITY

Section 1. General.

The provisions of these Bylaws are applicable to all proceedings of the Virginia Solar Energy Development and Energy Storage Authority (the Authority) to the extent that the same are not inconsistent with the Code of Virginia (Code) or Executive Orders applicable to these proceedings. Whenever the provisions of these Bylaws are in conflict with the provisions of the Code or an applicable Executive Order, the latter shall control.

Section 2. Authority and Limitations.

The Authority is constituted under § 67-1500 of the Code as a body corporate and a political subdivision of the Commonwealth of Virginia. The Authority is specifically charged with the duties and responsibilities set forth in Title 67, Chapter 15, of the Code, primarily for the purpose of facilitating, coordinating, and supporting the development, either by the Authority or by other qualified entities, of the solar energy and energy storage industry, solar energy and energy storage projects, and associated supply chain vendors, among other such duties.

ARTICLE II. AUTHORITY OBJECTIVES

Section 1. General.

The Virginia Solar Energy Development and Energy Storage Authority is created to facilitate, coordinate, and support the development of the solar energy industry and solar-powered electric energy facilities in the Commonwealth. The Authority is directed to do so by developing programs to increase the availability of financing for solar energy projects, facilitate the increase of solar energy generation systems on public and private sector facilities in the Commonwealth, promote the growth of the Virginia solar industry, and provide a hub for collaboration between entities to partner on solar energy projects.

The Authority is charged with, among other tasks (i) facilitating, coordinating, and supporting the development, either by the Authority or by other qualified entities, of the solar energy and energy storage industries and solar energy and energy storage projects by developing programs that increase the availability of financing for solar energy projects and energy storage projects; (ii) facilitating the increase of solar energy generation systems and energy storage projects on public and private sector facilities in the Commonwealth; (iii) promoting the growth of the Virginia solar and energy storage industries; (iv) providing a hub for collaboration between entities, both public and private, to partner on solar energy projects and energy storage projects; and (v) positioning the Commonwealth as a leader in research, development, commercialization, manufacturing, and deployment of energy storage technology.

ARTICLE III. MEMBERS AND STAFF

Section 1. Appointment of Members and Terms

All appointments shall be in accordance with § 67-1502, of the Code. Any appointment to fill a vacancy shall be made in the same manner as the original appointment. The remainder of any term to which a member is appointed to fill a vacancy shall not constitute a term in determining the member's eligibility for reappointment.

Section 2. Election of Chair and Vice-Chair.

The Authority shall appoint from its membership a chairman and a vice-chairman, both of whom shall serve in such capacities at the pleasure of the Authority.

Vacancies in the position of Chair or Vice-Chair shall be filled for the remainder of the term by voice vote or roll call vote of the Authority at the next meeting following the occurrence of the vacancy.

Section 3. Authority Staff and Requests for Staff Assistance

The Department of Mines, Minerals and Energy (DMME) shall serve as staff to the Authority. The Director of the DMME shall serve as Director of the Authority and shall administer the affairs and business of the Authority in accordance with the provisions of § 67-1500.

The Director shall perform such other duties as prescribed by the Authority in carrying out the purposes of this chapter.

Any Authority member may request assistance from staff provided the request has been coordinated through the Chair or Vice-Chair of the Authority.

ARTICLE IV. MEETINGS

Section 1. Regular Meetings.

The meetings of the Authority shall be held on the call of the Chairman or whenever a majority of the members so request, at such time and place as the Authority may determine. All meetings consisting of more than two members to discuss business of the Authority, whether in-person, telephonically, or by other electronic communication, shall be open to the public and shall be preceded by the notice requirements set forth in the Virginia Freedom of Information Act, § 2.2-3707 of the Code. Authority members who wish to share or request information related to Authority business to or from more than one other member should do so through Authority staff.

A majority of members of the Authority serving at any one time shall constitute a quorum for the transaction of business. No business requiring a vote or final decision of the Authority may be conducted in the absence of a quorum, as defined in Section 6 below.

Section 2. Annual Meetings.

The last regular meeting of the calendar year shall be designated as an annual meeting. Elections of officers shall be held at the Annual Meeting.

Section 3. Committee Meetings.

The Authority may establish committees from time to time as needed to carry out the work of the Authority; provided, however, that all meetings of a committee consisting of more than two members of the Authority are open to the public and be preceded by the notice requirements set forth in the Virginia Freedom of Information Act, § 2.2-3707 of the Code.

Section 4. Special Meetings.

The Chair or any three members of the Authority may call a special meeting for a specific purpose or purposes. No business shall be transacted at such special meeting except that expressly sent out in the notice of the special meeting. Special meetings consisting of more than two members of the Authority shall be open to the public and be preceded by the notice requirements set forth in the Virginia Freedom of Information Act, § 2.2-3707 of the Code.

Section 5. Notice of Meetings.

In all cases, the public shall be notified of regular and special meetings of the Authority at a time and in a manner consistent with the requirements of the Virginia Freedom of Information Act, § 2.2-3707 of the Code.

Section 6. Quorum.

For any meeting of the Authority, a simple majority of the members of the Authority shall constitute a quorum. If a quorum has not been achieved, the meeting of the Authority may proceed; provided, however, that voting on matters before the Authority shall be postponed until a meeting of the Authority at which a quorum is present.

Section 7. Conduct of Meetings.

The Chair of the Authority shall conduct the meetings of the Authority and shall rule on the interpretation and application of the Code and these bylaws.

The Vice-Chair of the Authority shall preside over meetings of the Authority in the absence of the Chair. In the event that neither the Chair nor the Vice-Chair of the Authority shall be in attendance at a meeting where a quorum is nonetheless present, any member of the Authority may call the meeting to order, and the members present shall elect a Chair pro tempore to preside over the meeting. Where a quorum is not present, a vote of the majority of those members present shall determine the Chair pro tempore.

All actions and decisions of the Authority shall be made upon the motion of a member, duly seconded by another member and approved by a majority of the members who are present and voting.

The Chair shall put the question submitted to the Authority for a voice vote and shall call for a vote only after determining that there are no more Authority members who wish to speak, or upon approval of a motion to close debate.

Any member who may not participate in the Authority's consideration of a matter under the Va. Conflicts of Interest Act must comply with the disclosure requirements of the Act and not participate in the discussion or vote on the matter.

If it appears to the Chair, upon the voice vote being taken, that the members of the Authority are divided on any question, the Chair shall determine the vote of the members by roll call. A tie vote on any matter defeats the motion or issue upon which the vote is taken. At the conclusion of the vote on the motion, the Chair shall announce whether the motion has been adopted or defeated.

Section 8. Agenda.

The proposed agenda for any meeting shall be determined by the Chair in consultation with staff. In addition, any members of the Authority may suggest items to be included on the agenda.

The agenda for regular meetings of the Authority will normally include the following: (1) review and approval of the last minutes of the Authority; (2) a status report on the work plan and action items agreed to by the Authority; (3) a status report on federal agency actions that may affect solar energy and energy storage development in Virginia; and (4) other information of interest to the Authority.

An opportunity shall be provided at each meeting of the Authority for public comment. Any person who desires to speak will be asked to provide his or her name and the matter to be addressed prior to each meeting at which the public is able to comment.

Section 9. Amendments.

The bylaws of the Authority may be amended at any regular meeting of the Authority at which a quorum is present by a majority vote.

Section 10. Rules of Order

Informal rules of order shall govern all matters of procedure unless objected to by any Authority member. If such an objection occurs, then “Robert’s Rules of Order, Newly Revised” shall be the parliamentary authority for all matters of procedure not specifically covered by these bylaws.