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STATE CORPORATION COMMISSION

October 1, 2015

The Honorable Terence R. McAuliffe
Governor, Commonwealth of Virginia

The Honorable John C. Watkins
Chairman, Senate Committee on Commerce and Labor

The Honorable Terry G. Kilgore
Chairman, House Committee on Commerce and Labor

Gentlemen:

Chapter 771 of the 2011 Virginia Acts of Assembly directs the State Corporation Commission ("Commission") to provide annual reports on any solar energy distributed generation programs approved pursuant to that legislation.

Additionally, Chapter 382 of the 2013 Virginia Acts of Assembly directs the Commission to conduct a renewable energy pilot program for third party power purchase agreements and to review such program biennially starting in 2015.

The Commission is pleased to transmit the attached report regarding the above-referenced directives. As always, we will provide additional information or assistance upon request.

Please let us know if you need additional information or assistance.

Respectfully submitted,

Mark C. Christie, Chairman

James C. Dimitri, Commissioner

Judith Williams Jagdmann, Commissioner

Attachment

EXECUTIVE SUMMARY

Chapter 771 of the 2011 Virginia Acts of Assembly ("Chapter 771") directs the State Corporation Commission ("Commission") to consider for approval petitions filed by a utility to construct and operate distributed solar generation facilities and to offer special tariffs to facilitate customer-owned distributed solar generation. Pursuant to Chapter 771, the Commission has received and approved two such applications from Virginia Electric and Power Company d/b/a Dominion Virginia Power ("DVP" or the "Company"). A third application filed by DVP, which is partly based on the first application described below, was received and approved by the Commission. These applications are:

(i) An application to construct and operate distributed solar generation facilities (called the Solar Partnership Program (the "Partnership Program"));[1]

(ii) An application for approval of tariffs designed to facilitate customer-owned distributed solar generation as an alternative to net metering (called the Solar Purchase Program (the "Purchase Program"));[2] and

(iii) An application for a pilot and experimental rate, designated Rider DCS, to enable customer purchases of distributed solar generation pursuant to § 56-234 B of the Code of Virginia.[3]

The Solar Partnership Program is a demonstration program in which DVP is authorized to construct and operate up to 30 megawatts ("MW") of company-owned solar distributed generation ("DG") facilities under a blanket certificate of public convenience and necessity ("CPCN") on leased commercial customer property and in community settings. This demonstration program is intended to study the benefits and impacts of solar DG on targeted

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[1] *Application of Virginia Electric and Power Company For approval of a Community Solar Power Program and for certification of proposed distributed solar generation facilities pursuant to Chapter 771 of the 2011 Virginia Acts of Assembly and §§ 56-46.1 and 56-580 D of the Code of Virginia,* Case No. PUE-2011-00117, 2012 S.C.C. Ann. Rept. 328, Order (Nov. 28, 2012).

[2] *Application of Virginia Electric and Power Company For approval of a special tariff to facilitate customer-owned distributed solar generation pursuant to Chapter 771 of the 2011 Virginia Acts of Assembly,* Case No. PUE-2012-00064, 2013 S.C.C. Ann. Rept. 269, Order (Mar. 22, 2013).

[3] *Application of Virginia Electric and Power Company For approval of a pilot and experimental rate, designated Rider DCS, to enable customer purchases of distributed solar generation pursuant to § 56-234 B of the Code of Virginia,* Case No. PUE-2015-00005, Doc. Con. Cen. No. 150820013, Final Order (Aug. 7, 2015).

distribution circuits. The program currently has six operational facilities and five additional projects under construction that are expected to be operational before year-end. The cumulative capacity of the eleven facilities total nearly 8.5 MW direct current ("DC"), or about 6.7 MW alternating current ("AC"). DVP projects that the expected cumulative capital costs of these 11 projects will be approximately $20.5 million by the end of 2015.

In addition to site development, the Solar Partnership Program also includes an educational program that eventually will enable local personnel to provide secondary and post-secondary instruction on solar powered systems. DVP also is using this program to gather information that should enable the Company to refine its electrical distribution planning model and forecast future solar generation impacts on certain areas of DVP's circuitry and distribution system.

The Solar Purchase Program is a demonstration program that began June 20, 2013, and consists of a new special tariff under which the Company will purchase no more than 3 MW of energy output from customer-owned distributed solar generation installations. The program is designed to facilitate customer-owned distributed solar generation facilities and to offer an alternative to net energy metering by permitting the purchase of 100% of the energy output, including all environmental attributes associated with renewable energy certificates ("RECs") from qualifying solar customer generators. Specifically, this program permits eligible customers to purchase all of their electricity from DVP on their current rate schedule and to sell all of their solar generation to the Company under the proposed special tariff. Under this program, customers install and own solar distributed generation systems and sell that power back to DVP along with associated RECs at a premium rate of 15 cents per kilowatt-hour ("¢/kWh"). This

program continues to experience strong interest and as of June 30, 2015, 84 projects have been completed, with another 36 projects under construction, totaling 1,704.6 kilowatts ("kW").

On January 20, 2015, Dominion Virginia Power filed an application for approval of the Dominion Community Solar Pilot ("DCS Pilot") and experimental rate, designated Rider DCS, to enable voluntary customer purchases of 100 kWh blocks of solar generation from a company-owned, 2 MW DC solar DG facility sited in Virginia. This facility would be constructed under the blanket certificate of public convenience and necessity that the Company received with approval of the Solar Partnership Program. According to DVP, the DCS Pilot would enable DVP to assess the level of interest of customers willing to support the development of solar DG, but may not be able or willing to install solar generation facilities on their own properties. On August 7, 2015, the Commission granted the Company's application for the DCS Pilot and Rider DCS, as modified by the provisions of a Stipulation and Recommendation.

Chapter 382 of the 2013 Virginia Acts of Assembly ("Chapter 382") directs the Commission to conduct a pilot program within the certificated service territory of a certain investor-owned-electric utility (or DVP). Under the pilot program, a person that owns or operates a solar-powered or wind-powered electric generation facility with a capacity between 50 kW and 1 MW that is located on the premises owned or leased by an eligible customer-generator will be allowed to sell the electricity generated from such facility exclusively to such eligible customer-generator under a power purchase agreement ("PPA"). The PPA may provide third party financing of the costs of the renewable generation facility. The pilot program limitation of 50 MW includes participation among jurisdictional and non-jurisdictional customers, and the minimum size requirement does not apply to certain non-profit entities.

Pursuant to Chapter 382, guidelines governing the pilot program, referred to as the Third Party PPA Pilot Program, were established by the Commission on November 14, 2013.[4]

PROGRAMS

Solar Partnership Program

The Commission approved the Partnership Program on November 28, 2012. This program is designed to study the impacts and assess the benefits of distributed solar photovoltaic generation on DVP's electric distribution grid.

Under the Partnership Program, DVP is authorized to construct and operate up to 30 MW of company-owned solar distributed generation facilities under a blanket CPCN on leased commercial customer property and in community settings. DVP conducts two types of projects: (i) for smaller projects of less than 500 kW located on public or community buildings, these projects are designed to provide opportunities for customer outreach, facilitate education relative to solar technologies, and provide generation load profile data in specific locations across DVP's service territory; and (ii) designed for larger sites that can accommodate solar DG facilities of greater than 500 kW on targeted DVP circuits. As proposed by DVP, all prospective project sites undergo a rigorous selection process, including thorough engineering analyses, and are subject to mutually agreeable lease terms with property owners.

According to the Company's annual report,[5] more than 700 customer inquiries and applications to participate in the program have been received and evaluated. DVP is currently partnering with qualifying commercial, industrial, high school, and university customers with suitable facilities located in select target areas for installation of solar projects for demonstration

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[4] *Commonwealth of Virginia, ex rel. State Corporation Commission, Concerning the establishment of a renewable energy pilot program for third party power purchase agreements*, Case No. PUE-2013-00045, 2013 S.C.C. Ann. Rept. 405, Order Establishing Guidelines (Nov. 14, 2013).

[5] DVP's Annual Report was submitted to the Commission on September 4, 2015, and may be seen in its entirety at: http://www.scc.virginia.gov/docketsearch#/caseDetails/130374.

and grid impact study purposes. Currently, six projects are operational and another five projects are under construction with completion expected by year-end. These eleven projects are expected to yield about 8,479 kW DC, or about 6,680 kW AC as shown in the following table.

Site	DVP Region	Study Type	Size (kW DC)	Size (kW AC)	Status/ In-service Date	Mount System
Canon	Eastern	Heavy Load	521	500	06/14/14	Roof
Old Dominion University	Eastern	Demonstration	151	125	07/08/14	Roof
Capital One	Central	Heavy Load	633	500	12/01/14	Ground
Virginia Union University	Central	Demonstration	69	50	12/31/14	Roof
Prologis Concorde Center	Northern	Heavy Load	859	746	03/31/15	Roof
Randolph-Macon College	Central	Demonstration	69	50	03/31/15	Roof
Philip Morris Park 500	Central	Light Load	2,450	2,000	Under construction	Ground
Western Branch High School	Eastern	Heavy Load	1,003	806	Under construction	N/A
Merck	Western	Heavy Load	2,211	1,512	Under construction	N/A
Site 10	Western	Conservation Voltage Reduction	500	381	Under construction	N/A
Site 11	Northern	Demonstration	13	10	Under construction	N/A
Expected Total			**8,479**	**6,680**		

Initial study objective data is being analyzed to develop better planning models and a more robust grid protection plan for interconnection of renewable generators. The grid impact study objectives are to:

1. Determine the effect of Solar DG on circuit loading, analyze the peak demand reduction benefits to the distribution system, and collect the necessary data to develop a solar DG load model for the Company's distribution planning process.

2. Quantify the reduction in line losses from solar DG at various points on the distribution system.

3. Study the operational impact of "high saturation" solar DG on a single circuit.

4. Assess the potential for solar DG to improve conservation voltage reduction performance.

To further understand how solar energy intermittency and energy storage may play a more prominent role in energy distribution in the future, DVP installed battery storage capability under a separately funded study at the Randolph-Macon College solar DG demonstration facility. The site is designed to provide data on the cost-effectiveness of battery and solar integration, system design, layout, software, controls, data collection, and system protection considerations. The storage portion of the facility consists of two batteries, a 48 kW, 148 kWh zinc air flow battery and a 7 kW, 28 kWh aqueous hybrid ion battery. The battery study objectives will focus on the effects on the distribution system and the performance metrics of the batteries. The battery storage capability of this site is in start-up mode.

Technical feasibility specifications also were developed by DVP along with solar consultants and contractors regarding roof structural analysis, roof surface condition, a building's age and condition, and energy evaluation of the potential solar system, an environmental review of the potential site using parameters within the Department of Environmental Quality's solar "Permit by Rule" regulations, and a preliminary interconnection study. Of the current sites secured to develop projects, only three are ground-mount solar system locations; the others are roof-mount systems.

DVP also has entered into master service agreements with a select group of qualified contractors for the construction and operation of the solar DG projects, and contracts will be awarded by competitive bid from these contractors. This enables DVP to maintain consistent warranties and operation plans once the generators are placed in service.

In addition to site development, DVP is establishing an educational program to coincide with the installation of solar arrays on academic facilities. This program is designed to train local educational faculty and staff on the operation of solar powered systems in order to enable

secondary and post-secondary school level instruction. The education plan also will provide detailed information on the specifics of the on-site system and key considerations used during the design process. General customer information is available on DVP's website regarding the projects and a more detailed web-based display of real-time operation is available to the participants and DVP using a common software vendor platform for solar system monitoring and data collection. Such software allows DVP to manage its distributed generation solar system through a common web hosting platform that provides daily performance results, including indices such as photovoltaic output, weather station results, solar irradiance and solar system availability at each site. This information enables DVP to refine its electrical distribution planning model and to forecast future solar generation impacts at the system level for the study objective circuits – *i.e.*, the heavily loaded, lightly loaded, and conservation voltage reduction circuits.

Although the early installations are now providing data, it is early in the evaluation process. The facilities have generated over 1,100 megawatt-hours so far this year, and preliminary information appears encouraging as the operational facilities are generally producing above 80% of its rated power output and its forecasted energy.

Solar Purchase Program

On March 22, 2013, the Commission approved DVP's application to implement the Solar Purchase Program, subject to certain requirements. Pursuant to this tariff, DVP will purchase up to 3 MW of energy output from customer-owned solar DG installations as an alternative to net energy metering. The 3 MW limit is divided into two categories with 60% (1.8 MW) allocated to residential participants and the remaining 40% (1.2 MW) allocated to non-residential

participants. DVP designed this program as an alternative to net energy metering and also as a means to help participants overcome the high cost of installing solar generation.

DVP launched the Purchase Program on June 20, 2013. Positive customer responses resulted in DVP reaching the non-residential limit within 25 days, as well as a substantial portion of the residential limit of program reservations. Such early and overwhelming interest created certain issues with customers reserving space but then not submitting required documentation and following through with actual participation in the program. As a result, DVP implemented a 60-day deadline for submitting proper paperwork after reserving space to continue to the next phase of actual installation. This prevents customers who decide not to continue with participation from holding space that could be used by another interested customer.

As of June 30, 2015, 84 projects have been completed under the Purchase Program for a combined capacity of 984.11 kW. An additional 36 projects totaling 720.49 kW are currently under construction. Approximately 1,100 kW of additional capacity is currently reserved by interested customers. As of June 30, 2015, about 109.17 kW of capacity was available for residential customers and about 38.41 kW of capacity was available for non-residential customers.

The Company continues to experience a large variance in the time required for customers to be ready to interconnect their system, an average of over 100 days between receipt of completed project paperwork and project completion. There are several factors that influence the installation timeline, such as: when the customer contracts with a solar installer; inclement weather or site conditions; approval of zoning or property covenant restrictions; system size; and interconnection requirements.

DVP continues to look for and implement adjustments to improve the program's process

and the customer's experience. Implementation issues include: customer education regarding program structure and determining billing charges and credits; electrician and vendor education regarding electrical wiring connections in metering equipment; ordering and installing the proper meters; and manual billing required for initial billing and off-cycle meter readings.

DVP continues to rely on its website and solar installers to inform customers about the program and can be found at: www.dom.com/solarpurchase. The website contains information regarding bill samples, frequently asked questions, the on-line reservation form, and current availability remaining in the program. DVP states that the majority of program participants have been satisfied with the program, even though some may decide not to move forward with the program.

		Residential	**Non-residential**	**Total**
Reservations	Number since inception	601	98	699
	Total kW AC reserved	5495.9	2989.7	8485.6
	Average system size kW AC	9.1	30.5	12.4
	Number net metering reserved	49	21	70
	Average size net metering transfers	6.2	21.8	10.9
	Number currently reserved	169	39	208
	Number reservations withdrawn	120	21	141
Projects in development	Total number	22	14	36
	Average days to develop	95.31	126.33	102.22
Meters installed/ projects completed	Total number	66	18	84
	Total kW AC completed	459.44	524.67	984.11
	Average size kW AC	6.96	29.12	10.23
	Net metering transfers	5	4	9
	Average net metering transfer kW AC	5.8	20.3	12.3

There were 76 installed projects in 2013 and 2014, representing about 850 kW AC that generated nearly 775,000 kWh of electricity and produced about 775 solar RECs. As of June 30, 2015, an additional eight projects have been completed for about 115 kW AC, bringing the total

number of projects to 84 with capacity of nearly 1 MW AC. In 2015, these 84 projects have produced a combined 688,044 kWh of electricity and 688 solar RECs.

The purchase price for the power generated from customer participants in the program is 15¢/kWh. The purchase price is composed of two components: (a) an avoided cost component including fuel, line loss, and capacity as determined under DVP's existing avoided cost tariff (Schedule 19); and (b) a voluntary environmental contribution from revenues provided by customers voluntarily participating in the Dominion Green Power® program. The avoided cost component is eligible for cost recovery from customers through the company's fuel factor. The difference between the avoided cost component and the 15¢/kWh comes from the Dominion Green Power program as payment for the environmental attributes, the solar RECs associated with the solar renewable generation. In 2014, 772 solar RECs were produced at an average annual price per solar REC of $91.72, and the average price per solar REC through June 30, 2015 is $99.28.

Generation output of an average Solar Purchase Program interconnected system generally peaks between 1 p.m. and 2 p.m. The data collected so far continues to show that many installations are starting with a lower capacity factor than the anticipated range of 10% to 20%.

Third Party PPA Pilot Program

On November 14, 2013, the Commission issued its Order Establishing Guidelines regarding the Third Party PPA Pilot Program within DVP's service territory. Chapter 382 directed the Commission to establish guidelines concerning (i) information to be provided in written notices; and (ii) procedures for collecting and posting information derived from such notices on the Commission's website.[6] It is worth noting that although not part of the Third

[6] The Commission's guidelines and posted information for participating projects are located at: https://www.scc.virginia.gov/pue/pilot.aspx.

Party PPA Pilot Program, Appalachian Power Company has requested Commission approval for an experimental rider for the purchase of non-dispatchable renewable energy,[7] which is currently pending before the Commission.

To date, Secure Futures LLC ("SFLLC") has been the only participant in the Third Party PPA Pilot Program with eight proposed facilities at high school and university sites, totaling 967.4 kW of solar generation under notification to be installed. SFLLC attributes the low participation rate in Virginia to what it deems as high financial and regulatory hurdles that stand in the way of commercialization of solar, such as lack of incentives for solar investors as compared with high successes achieved in adjoining states. SFLLC also states that such challenges have delayed its ability to obtain financing until recently. Now that SFLLC has obtained a strong financing partner, it anticipates increasing its activity in the Third Party PPA Pilot Program to more than 10 MW of solar projects in 2016. Note that the Commission has not received any notice of intent regarding wind projects.

Owner-Operator	Notice of Intent Date	Effective Date	Duration of PPA	Solar kW	Available Pilot kW, 50,000
Richmond Solar	09/10/15	01/20/16	20 years	155.4	
Albemarle Solar	09/10/15	03/28/16	20 years	88.0	
Albemarle Solar	09/10/15	03/28/16	20 years	166.0	
Albemarle Solar	09/10/15	03/28/16	20 years	95.0	
Albemarle Solar	09/10/15	03/28/16	20 years	198.0	
Albemarle Solar	09/10/15	03/28/16	20 years	143.0	
Albemarle Solar	09/10/15	03/28/16	20 years	55.0	
Lylburn Solar	09/10/15	06/05/16	20 years	67.0	
TOTAL				967.4	49,032.6

SFLLC also states that it has another 2.1 MW of solar projects under contract for customer self-generation agreements in Virginia but not within DVP service territory.

[7] *Application of Appalachian Power Company For approval of an experimental rider R.G.P. for the purchase of non-dispatchable renewable energy,* Case No. PUE-2015-00040, Order for Notice and Hearing (May 6, 2015).

CONCLUSION

On September 4, 2015, DVP submitted to the Commission's Staff its second annual report on the Solar Partnership Program and the Solar Purchase Program. DVP's report provides a more detailed review of program implementation, customer interest, the selection and development of project sites, and initial data collected and associated preliminary results. It also includes initial operating information, a data collection plan to support the study objectives, and other information about installation costs as requested by the Commission. This report is available through the Commission's website, www.scc.virginia.gov/case, by searching for either Case No. PUE-2011-00117 or Case No. PUE-2012-00064.

Although DVP has several projects underway and is currently collecting and evaluating information, data regarding energy and peak output data and the cost/benefit analysis will be more meaningful after each facility has been in operation for at least one year. The solar marketplace continues to evolve with lower installation prices, new regulations affecting customer-owned solar installations, and announcements of additional solar generation by DVP. Customer interest remains steady with growth occurring in both programs. The Company has begun to study the Solar Partnership Program installations per the goals and objectives of Chapter 771 and the Commission's approval of the programs.

DVP states that results to date show solar energy systems can produce renewable energy near the point of use to reduce the amount of electricity or electricity capacity from other sources. Planning models will be refined using this information to determine the extent to which adding Solar DG to the system reduces the need to purchase power in the wholesale markets. Further study and additional operating information is required to evaluate any long-term savings by reducing line losses from on-site electricity production.

Despite increasing data that large-scale solar projects can be constructed at a cost lower than smaller DG systems, it is imperative to understand how multiple smaller systems interact with the distribution grid as customer interest continues to grow. Large roof-top solar systems can be more than double the installation cost of large ground-mounted systems, but larger installations are commonly interconnected at transmission voltage levels impacting the local grid differently than smaller systems interconnected at distribution levels.

A more comprehensive analysis will be available in DVP's next annual report on or about September 1, 2016, including any advances in solar, battery storage, and smart inverter technologies as they become integrated into the grid.

The Commission will continue to monitor DVP's demonstration programs and maintain its website regarding participation in the Third Party PPA Pilot Program. The Commission plans to provide its next annual report by October 1, 2016.