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STATE CORPORATION COMMISSION

September 30, 2016

The Honorable Terence R. McAuliffe
Governor, Commonwealth of Virginia

The Honorable Frank W. Wagner
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 aforementioned directives. Please let us know if you need additional information or assistance.

Respectfully submitted,

James C. Dimitri, Chairman

Mark C. Christie, 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"). These applications are:

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

(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]

The Commission also has approved DVP's filing pursuant to § 56-234 B of the Code for a pilot and experimental rate, Rider DCS, to enable customer purchases of distributed solar generation from facilities that are part of the Partnership Program.[3] This report also discusses the Third-Party PPA Pilot Program that the Commission conducts pursuant to Chapter 382 of the 2013 Virginia Acts of Assembly ("Chapter 382").[4] A brief update on each of these initiatives is provided below.

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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, 2015 S.C.C. Ann. Rept. 268, Final Order (Aug. 7, 2015).

[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).

DVP Partnership Program

The 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 distribution circuits. According to the Company's annual report provided to the Commission ("2016 Company Report"),[5] the Partnership Program currently has eight operational facilities and two additional projects under construction that are expected to be operational before year-end 2016. (See chart on page 5.) The cumulative capacity of the ten facilities total 8,418 kW direct current ("DC"), or 6,670 kW alternating current ("AC"), connected to the electric grid. DVP projects that the expected cumulative capital costs of these ten projects will be approximately $20.9 million by year-end 2016.

In addition to site development, the Partnership Program also includes an educational component that 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.

DVP Purchase Program

The Purchase Program is a demonstration program that began June 20, 2013, and consists of a special tariff under which the Company will purchase no more than 3 MW of energy output from customer-owned distributed solar generation installations. The Purchase Program is

[5] DVP's recent Annual Report was submitted to the Commission on September 1, 2016, and may be seen in its entirety at: http://www.scc.virginia.gov/docketsearch/DOCS/3%40p701!.PDF

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 rate of 15 cents per kilowatt-hour ("¢/kWh"). According to the 2016 Company Report, the Purchase Program continues to experience strong interest and as of June 30, 2016, 123 customer installations have been completed, with another 19 under construction, totaling 1,965.2 kilowatts ("kW"). (See chart on page 10.)

On January 20, 2015, DVP 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 CPCN that the Company received when the Commission approved the Partnership Program. According to the Company, 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 approved the Company's application for the DCS Pilot and Rider DCS, as modified by the provisions of a Stipulation and Recommendation. To date, the DCS Pilot and its experimental rate, Rider DCS, are not yet available to customers, as the facilities are not completed.

Related Matters

Pursuant to Chapter 382, the Commission conducts a pilot program within the certificated service territory of 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. (For information on program participation, see page 12.)

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 reported 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 2016 Company Report, nearly 750 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 and grid impact study purposes. Currently, eight projects are operational and another two projects are under construction with completion expected by year-end 2016. These ten projects are expected to yield approximately 8,418 kW DC, or about 6,670 kW AC, as shown in the following table.

PARTNERSHIP PROGRAM PROJECT DESCRIPTIONS

Site	DVP Region	Study Type	Size (kW DC)	Size (kW AC)	Status/ In-service Date	Mount System
Canon-Gloucester	Eastern	Heavy Load	521	500	06/14/14	Roof
Old Dominion University	Eastern	Demonstration	151	125	07/03/14	Roof
Capital One	Central	Heavy Load	633	500	12/17/14	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	03/31/16	Ground
Western Branch High School	Eastern	Heavy Load & Customer Education	1,003	806	04/25/16	Roof
Merck	Northern	Heavy Load	2,211	1,512	Under construction -4Q 2016	Ground
University of Virginia	Northern	Demonstration	452	381	Under construction – 4Q 2016	Roof
Expected Total			**8,418**	**6,670**		

According to DVP, initial study data is being analyzed to develop better planning models and a more robust grid protection plan for the 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 energy 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.

Also under the Partnership Program, DVP installed battery storage capability under a separately funded study at the Randolph-Macon College solar DG demonstration facility to help understand how energy storage and solar energy intermittency may interact in future energy distribution. 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. Until recently, the storage portion of the facility consisted of two batteries: (i) a 48 kW, 148 kWh zinc air flow battery; and (ii) a 7 kW, 28 kWh aqueous hybrid ion battery. The battery study objectives focus on the effects of the batteries on the distribution system and the performance metrics of the batteries themselves. In August 2016, after about a year of operation, DVP removed the zinc air flow battery from testing. Testing continues of the aqueous hybrid ion battery to evaluate peak shifting, duty cycling, and degradation.

For roof-mounted solar DG systems, DVP, along with solar consultants and contractors, developed technical feasibility specifications regarding roof structural analysis, roof surface condition, a building's age and condition, an 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, three are ground-mount solar system locations while the others are roof-mount systems. Each site's system is mounted with its own fixed tilt angle.

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 for each selected location. This enables DVP to maintain consistent warranties and operation plans once the generators are placed in service.

In addition to site development, DVP established an educational component to coincide with the installation of solar arrays on academic facilities. This initiative 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 still rather early in the evaluation process. The facilities have generated over 4,835 megawatt-hours ("MWh") of energy so far, and recorded information appears encouraging. Data reflects that the operational facilities are generally producing near the rated power output and generally above 80% of forecasted energy. Additionally, preliminary results for these few facilities generally indicate a positive impact to circuit voltages; a reduction in energy line losses; more frequent use of voltage/VAR devices and the need to carefully assure proper wire sizes along with placement and control settings for such devices; and a supporting impact on demand resulting from reverse power flows when employing proper protection controls. These factors indicate careful planning is required for the successful integration of larger facilities.

Solar Purchase Program

On March 22, 2013, the Commission approved DVP's application and tariff to implement the 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 the Purchase 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, and continues to receive positive customer response. As of June 30, 2016: (i) 123 installations have been completed under the Purchase Program for a combined capacity of 1,544.4 kW; (ii) an additional 19 installations totaling 420.8 kW were under construction; and (iii) approximately 870 kW of additional capacity was reserved by interested customers. Approximately 128.6 kW of capacity was still

available for residential customers and about 39.8 kW of capacity was still available for non-residential customers.

On average, customers participating in the Purchase Program have experienced a lag of 87 days between receipt of all installation paperwork and completion of the installation. However, the Company continues to notice a large variance in the time required for customers to interconnect their systems. 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; interconnection requirements; and systems associated with new service accounts where principal electric service is still in the process of being established.

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; manual billing required for initial billing and off-cycle meter readings; and method of reimbursement for customer accounts with a credit balance.

DVP continues to rely on its website, www.dom.com/solarpurchase, along with solar installers to inform customers about the Purchase Program. The website is the main hub of program information for such things as bill samples, frequently asked questions, the online 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 for various reasons.

PURCHASE PROGRAM PARTICIPATION

		Residential	Non-residential	Total
Reservations	Number since inception	859	126	985
	Total kW AC reserved	9,112.1	3,969.0	13,081.0
	Average system size kW AC	10.61	31.5	13.28
	Number net metering reserved	61	21	82
	Average size net metering transfers kW AC	6.5	21.8	11.21
	Number currently reserved	165	38	203
	Number reservations withdrawn	130	23	153
Installations in development	Total number	12	7	19
	kW in development	73.3	347.5	420.8
Meters installed/ installations completed	Total number	94	29	123
	Total kW AC completed	731.8	812.6	1,544.4
	Average size kW AC	7.79	28.02	12.56
	Net metering transfers	7	4	11
	Average net metering transfer kW AC	6.57	20.33	11.57

There were 76 installations in 2013 and 2014, representing about 850 kW AC that generated nearly 775,000 kWh of electricity and produced about 775 solar RECs. In 2015, an additional 23 installations were completed that together represented about 359 kW AC, bringing the total number of installations to 99 with capacity of nearly 1.2 MW AC producing 1,411 MWh and 1,411 RECs. As of June 30, 2016, the program reached 123 installations and over 1.5 MW (1,544.4 kW). In total, the program's 123 installations have generated over 3,187 MWh and produced nearly 3,200 solar RECs since implementation in 2013.

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, energy 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 purchase price comes from the Dominion Green Power program as payment for the solar RECs, which are the environmental attributes associated with solar renewable generation. In 2015 1,411 solar RECs were produced at an average annual price per solar REC of $102.70. The current average price per solar REC through June 30, 2016 is $114.51.

Third-Party PPA Pilot Program

Pursuant to Chapter 382, the Commission conducts a pilot program within the certificated service territory of 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 PPA. On November 14, 2013, the Commission issued its Order Establishing Guidelines regarding the Third-Party PPA Pilot Program within DVP's service territory.[6]

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 999.25 kW of solar generation under notification to be installed. The first facility became operational in May 2016, and the others are expected online by year-end. 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's service territory. SFLLC attributes the low participation rate in the Third-Party PPA Pilot Program to what it deems as high financial and regulatory hurdles that

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

stand in the way of commercialization of solar power, such as lack of incentives for solar investors as compared with high successes achieved in adjoining states. Since SFLLC has obtained a strong financing partner, it anticipates increasing its activity in the Third-Party PPA Pilot Program to more than 10 MW.

Note that the Commission has not received any notice of intent regarding wind projects.

THIRD-PARTY PPA PILOT PROGRAM PARTICIPATION

Owner-Operator	Notice of Intent Date	Effective Date	Duration of PPA	Solar kW	Available Pilot kW, 50,000
Richmond Solar	09/10/15	05/26/16	20 years	187.25	
Albemarle Solar	03/18/16	10/24/16	20 years	88.0	
Albemarle Solar	03/18/16	10/24/16	20 years	166.0	
Albemarle Solar	03/18/16	10/24/16	20 years	95.0	
Albemarle Solar	03/18/16	10/24/16	20 years	198.0	
Albemarle Solar	03/18/16	10/24/16	20 years	143.0	
Albemarle Solar	03/18/16	10/24/16	20 years	55.0	
Lylburn Solar	03/18/16	11/25/16	20 years	67.0	
TOTAL				999.25	49,000.75

Additional Solar Activity

Information concerning utility-specific solar and other renewable energy related programs and facilities may be found in the Commission's September 1, 2016 Status Report: Implementation of the Virginia Electric Utility Regulation Act provided to the Commission on Electric Utility Regulation of the Virginia General Assembly and the Governor of the Commonwealth of Virginia.[7]

CONCLUSION

On September 1, 2016, DVP submitted to the Commission's Staff its third annual report on the Partnership Program and the Purchase Program. DVP's report provides a more detailed

[7] This document is Report Document No. 272, publication year 2016, in Virginia's Legislative Information System.

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 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 collected preliminary data and has begun to study the Partnership Program installations in accordance with 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 effects on the electric grid.

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 systems interact with the electric grid as customer interest continues to grow. Large rooftop 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.

The Commission will continue to monitor DVP's demonstration programs and maintain its website regarding participation in the Third-Party PPA Pilot Program.