Partnerships Transforming the Power Sector

Innovative electric utility projects are helping the electric grid meet the needs of the 21st-century digital economy.

"Innovations Across the Grid (Volume II)," published by The Edison Foundation Institute for Electric Innovation in mid-December, features more than 50 case studies documenting how electric utilities are integrating new energy resources into the grid; providing customer solutions; and optimizing the grid itself.

Chapter 1 (from which the following three case studies were selected) highlights 18 projects detailing the development and integration of both large-scale and distributed solar, microgrids, battery storage, and community solar, as well as the monitoring and forecasting that are needed for successful integration of these resources.

Chapter 2 showcases 21 projects underway aimed at grid optimization and flexibility, including enhanced grid reliability and operational efficiency, grid intelligence and self-healing, substation automation, and outage management.

The final chapter focuses on customer solutions, such as energy tracking, smart pricing, bill alerts, outage communication, and smart thermostats.

Following are three examples that provide a glimpse into how utilities and their technology partners are designing and building the grid for the next century. "Innovations Across the Grid" can be downloaded at www.edisonfoundation.net.

Dominion's Solar Partnership Program

Launched in late 2012, the Solar Partnership Program is a multi-year pilot program designed to expand Dominion Virginia Power's (DVP's) understanding of community-based solar energy. The study will assess the impact and benefits of solar power, while supporting and encouraging solar energy growth in Virginia. DVP will construct and operate up to 30 megawatts (MW) of company-owned solar facilities on leased rooftops or on the grounds of commercial businesses and public properties. When fully implemented, the program will generate enough power for up to 7,500 homes.

The Solar Partnership Program allows DVP to gain experience in operating distributed solar generation while also offering unique opportunities to partner with eligible business customers with suitable facilities for solar installation. For the purposes of the program, DVP has identified two host-site participant groups. The majority will consist of larger sites that can accommodate

(L to R): NorthWestern Energy President and CEO Bob Rowe, Berkshire Hathaway Energy Vice President of Legislative and Regulatory Affairs Jonathan Weisgall, Commonwealth Edison President and CEO Anne Pramaggiore, and Pepco Holdings Executive Vice President and General Counsel Kevin Fitzgerald speak at the IEI book launch in mid-December.

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distributed solar generation greater than 500 kilowatts (KW). The company also will partner with four smaller sites capable of accommodating less than 500 KW, located on public or community buildings/sites for demonstration projects. These smaller installations provide opportunities for customer outreach and education on solar technologies.

An educational program will coincide with solar installations on secondary-level academic facilities throughout the state and will provide opportunities to expand local faculty and student knowledge on the operation of solar-powered systems. DVP also is planning to study electrical storage at one Solar Partnership Program site as renewable generation and its associated technologies become more prevalent in Virginia.

Over the course of the program, DVP plans to partner with 20-30 commercial, industrial, and academic customers. Each of these selected sites must meet one or more of the study objectives to participate in the Solar Partnership Program:

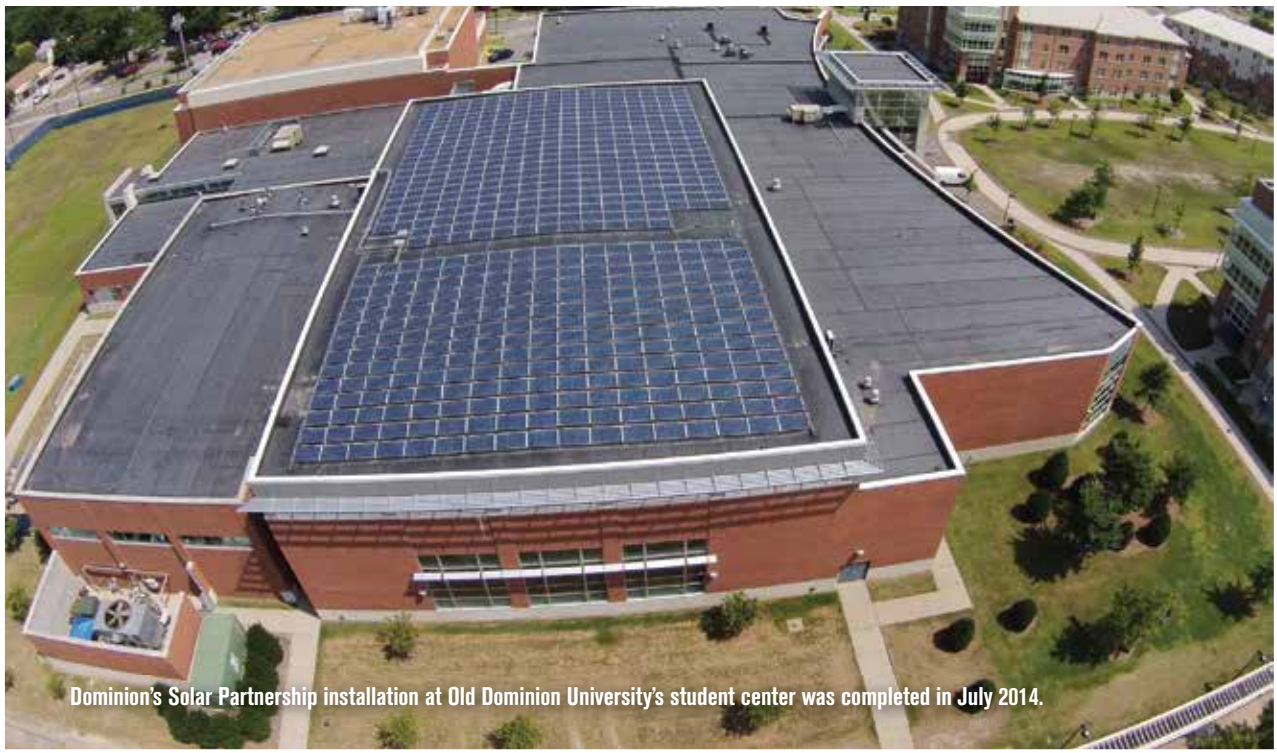
- determine the effects of solar distributed generation on circuit loading, analyze the peak demand-reduction benefits to the distribution system, and collect the necessary data to develop a distributed solar generation load model for the company's distribution planning process;
- quantify the reduction in line losses from distributed solar generation at various points on the distribution system;
- study the operational impact of "high saturation" solar distributed generation on a single circuit; and
- assess the potential for solar distributed generation to improve conservation voltage reduction performance.

As of September 2014, Dominion had completed two projects, including a 521-KW system on a heavily loaded circuit at Canon Environmental Technologies in Gloucester, VA, and the first demonstration site at Old Dominion University in Norfolk, VA. A project located at the Prologis Concord Distribution Center in Sterling, VA, was announced in July and will exceed 800 KW on two adjacent rooftops. Additional projects are under construction with a total of 6 MW expected to be in service or in the final stages of completion by year-end 2014. For more information, visit www.dom.com.

PG&E's Battery Energy Storage System Pilots

Pacific Gas & Electric (PG&E) has deployed two battery energy storage systems (BESS) as pilot projects. The Vaca-Dixon BESS is a 2-MW/14-megawatt-hour (MWH) system deployed at PG&E's Vaca-Dixon Substation in Vacaville, CA. The Yerba Buena BESS is a 4-MW/28-MWH system deployed at the end of a distribution feeder in San Jose, CA. Both utilize sodium-sulfur batteries supplied by Japan's NGK Insulators. The systems test and demonstrate a variety of functionalities of grid-scale battery storage, including peak-shaving, participation in California electricity markets, integration of variable renewable generation, and, in the case of the Yerba Buena BESS, islanding during grid disturbances.

Under a project funded by California's Electric Program Investment Charge (EPIC), PG&E is utilizing the Vaca BESS to conduct a robust exploration of participation in the California ISO (CAISO) energy and ancillary services markets, including enabling full automation in CAISO markets. Under a grant from the California Energy Commission, which also supplied some funding for



Dominion's Solar Partnership installation at Old Dominion University's student center was completed in July 2014.

Dominion

Department of Energy

The Yerba Buena battery energy storage system (4-MW/28-MWH) is deployed at the end of a PG&E distribution feeder in San Jose, CA.

the deployment of the systems, the Yerba Buena BESS is being used to study the performance of battery storage for peak-shaving, improving power quality and reliability, integrating variable renewable generation, and participating in CAISO ancillary services markets. This work is being done in collaboration with the Electric Power Research Institute, which is authoring reports on these functionalities along with engineer-of-record reports for both systems.

PG&E began operational testing of the Vaca BESS in late 2012, which identified baseline system characteristics for use in evaluating resource performance over its lifetime and confirmed that the system met or exceeded its operational specifications. Preliminary testing began with CAISO in the fall of 2013. As this was the first resource to participate in CAISO's Non-Generator Resource (NGR) market model developed for limited energy storage resources, both PG&E and CAISO used this testing to identify and resolve technical issues in scheduling and telemetry. Market operations were put on hold pending finalization of a storage interconnection process by PG&E's Electric Generation Interconnection group and deployment of a new dispatch control system developed for managing energy storage. Both were completed in July 2014, and the resource began participating in the CAISO NGR day-ahead energy market.

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Frequency regulation was added to this participation in September, and, as of November, the resource had logged approximately 100 hours providing both regulation up and regulation down services. This is part of a project under California's EPIC program to robustly explore the real-world performance of battery storage in CAISO's NGR market and deploy technology to fully automate battery response in CAISO markets.

The Yerba Buena BESS project began operational testing in the fall of 2013, including testing for its islanding functionality, in which the system can disconnect from the distribution feeder in the event of a utility disturbance or outage and supply downstream loads. Other testing has been conducted to study the impact on system reliability, power quality, and renewable integration under a grant from the California Energy Commission. The system also will be connected into and participate in the CAISO NGR market and is in the latter stages of the New Resource Implementation Process for doing so. Approximately half the energy capacity of the system is planned for use for distribution support and half for CAISO market services. For more information, visit www.pge.com.

SCE's Preferred Resources Pilot

Southern California Edison's (SCE's) Preferred Resources Pilot (PRP) is focused on supporting the company's core mission—safely meeting its customers' needs with reliable and affordable electricity. It is conducting a multi-year pilot to investigate and demonstrate how the integrated use of preferred resources (energy efficiency, demand response, clean distributed generation, and energy storage) may meet the growth in electricity demand in the PRP region—a transmission-constrained area of SCE's service territory encompassing 250,000 customers. This area has an anticipated load growth of more than 300 MW by 2022. It is most directly impacted by the closure of the San Onofre Nuclear Generating Station and will be affected should the nearby ocean-cooled power plants close in 2020 as part of California's "once-through" cooling policy.

FIGURE 1
A DIVERSE PORTFOLIO OF PREFERRED RESOURCES

Source: Southern California Edison

SCE seeks to meet the expected load growth and satisfy the region's reliability needs through the use of preferred resources.

The PRP seeks to design, acquire, and measure a diverse portfolio of preferred resources to meet the forecasted electricity demands in the PRP region. (See Figure 1.) Successful resource acquisition requires understanding the resources' delivery capabilities in terms of meeting peak needs and accounting for the achievable resource potential. SCE's most recent market potential study estimates that, through 2017, approximately 65 MW in potential peak-demand reduction can be achieved through energy-efficiency measures in targeted sectors and an 81-MW reduction in potential peak demand can be achieved from demand response. It is expected that the market can fill the remaining needs with distributed generation and energy storage.

SCE launched the PRP in 2013 by reaching out to and engaging customers, energy policymakers, regulators, and electric system operators; completing a local, integrated resource plan; and developing a framework and process to measure the performance capabilities of preferred resources. In the coming years, SCE will continue to engage stakeholders, acquire preferred resources to meet the expected growth, look for innovative opportunities to improve the use of preferred resources, and quantify the grid-level contributions from preferred resources.

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Results from the PRP also will inform the development of the grid of the future and contribute to California's progressive environmental and renewable energy goals. Meeting the PRP's goal of managing local load growth may reduce or eliminate the need to construct new natural gas plants in the PRP target area. By the end of 2017, SCE will use data collected from the pilot to evaluate preferred resources' performance capabilities to support deferral or elimination of the need for new natural gas-based generation in the PRP region.

The PRP represents an innovative approach to meeting customers' electricity needs. One of its key goals, which is to manage load growth in the PRP region to net-zero solely with clean resources, is unprecedented for SCE. It also departs from SCE's past practice of procuring clean resources simply to meet state energy policy goals, adding the need to meet local reliability requirements as a driver of clean resource acquisition. Finally, it represents an additional departure from SCE's current practice of conducting top-down, system-wide integrated resource planning to a bottom-up, targeted planning approach. For more information, visit www.sce.com. EP