DEMAND RESPONSE EMERGING TECHNOLOGIES PROGRAM

SEMI-ANNUAL REPORT 2013

SEPTEMBER 30, 2013

SDGE

A Sempra Energy utility℠

Table of Contents

I. Summary

The report is being submitted pursuant to Ordering Paragraph 59, and the discussion at pages 145 – 146 of Decision (D.) 12-04-045, which adopted budgets and programs for San Diego Gas & Electric Company's (SDG&E's) Demand Response (DR) portfolio for the 2012 – 2014 program cycle.

Ongoing projects include Mainstreaming AutoDR evaluation, Zinc-Flow Energy Storage, Flywheel Energy Storage, EIC Smart Home Demonstration, DR-enabled Pool Pumps, HVAC Optimization, and Smart Grid Integration Software Project.

II. Completed Projects in 2013

A. Home Area Network with Smart Appliances Assessment

1. Overview

The purpose of this project is to assess demand response enabled appliances and related devices alongside the home area network (HAN). Appliances and devices include washer, electric dryer, dishwasher, electric water heater, electric range, programmable communicating thermostat, in-home display, whole home load monitor and refrigerator. The DR-enabled appliances have a communicating module and can turn off, delay features, or change setpoints to dynamically reduce demand of the appliance. The DR-enabled appliances connect to the HAN, which includes a gateway and Smart Meter connectivity. Emerging Technologies will measure appliance load drops during a simulated DR event. Vendors have been selected using results from the REMA Study.

2. Collaboration

This project is a collaborative effort with SDG&E's Customer Programs. The results will be shared with other investor-owned utilities (IOU's) during scheduled monthly conference calls.

3. Status

All DR simulations and other on-site measurements, functional tests, and customer surveys have been completed. Analysis shows some appliances have significant load shifting and energy reduction capabilities but limited DR potential due to loads not being immediately "dispatchable". Overall, the appliances appear very energy efficient; additional savings and load drops resulting from smart features appear limited.

4. Next Steps

Final Report completed in Q2 2013. Report publishing and technology transfer pending.

III. Ongoing Projects in 2013

A. 100 kW / 150 kWh Zinc-Flow Energy Storage

1. Overview

Premium Power's systems are fully integrated with zinc-bromide ("ZnBr") flow batteries, power electronics, communications, mechanicals, controls and interconnections using UL-certified modular building blocks that can be "racked and stacked" in transportable or stationary configurations. The system will be employed for peak shaving, load management and/or demand response applications. The system will be monitored remotely and data collected for analysis by the project partners.

2. Collaboration

This project is a collaborative effort with California Energy Commission's (CEC) Public Interest Energy Research Program (PIER). Also, Pacific Gas and Electric Company (PG&E) and SDG&E's RD&D teams are contributing to this project. The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Site has been selected, however customer is hesitant to install. Upon installation Evaluation will take at least a year.

4. Next Steps

Install at Site.

B. Mainstreaming AutoDR

1. Overview

The goal of this project is to facilitate and accelerate the adoption and outreach of Auto-DR both in new construction and in existing buildings, engage industry stakeholders and participation, and provide support to codes and standards.

2. Collaboration

This project is in collaboration with PG&E and Southern California Edison Company. The results will be shared with other IOUs during scheduled monthly conference calls.

3. Status

Technology and market evaluation, as well as measurement and verification (M&V) and data processing have been completed.

4. Next Steps

Final report and applicable technology transfer are planned for completion in 2013.

C. Smart Grid for Buildings

1. Overview

The purpose of this project is to assess a solution to optimize the operation of energy resources against user-defined constrains, including but not limited to economics, reliability, comfort, and safety. In the case of utilities, the solution will interface with conventional and alternative energy generation, energy storage, and energy consumption resources, thereby optimizing and aggregating them into a virtual power plant, capable of meeting financial, reliability and other operational objectives of assets. These assets may range from loads, micro grids, to larger electric distribution feeders and transmission grids.

2. Collaboration

The results will be shared with other IOUs during scheduled monthly conference calls.

3. Status

Vendor and host site has been selected, proposals and contracting has completed. Installation of vendor hardware is complete; commissioning of existing building management system and new measurement and verification tools is complete. Commissioning of vendor hardware, preliminary vendor simulations, and data analysis are underway.

4. Next Steps

Complete commissioning. Complete evaluation. M&V, data analysis, final report, and technology transfer are scheduled for Q4 2013.

D. Energy Innovation Center Demonstration showcase

1. Overview

The purpose of this project is to develop a demonstrational showcase that exhibits energy saving demand response projects and activities. The showcase will be used for educational purposes and be placed in SDG&E's recently commissioned Energy Innovation Center (EIC). The two main DR technologies that will be demonstrated will be Home Area Network (HAN) technology and lighting controls in the EIC.

2. Collaboration

The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Most of the technologies in the Smart Home and the Lighting Controls have been installed and showcased. The next step is to complete the smart home technology installation for smart appliances and SEP 2.0 integration.

4. Next Steps

Complete design of Phase II (Self-Guided Tour).

E. 10 kW / 40 kWh Flywheel Energy Storage

1. Overview

Berkeley Energy Sciences Corporation (BESC) is developing a low-cost flywheel energy storage device. The first generation device has the target of 40 kWh / 10 kW. This flywheel uses high-strength steel as a rotor, and this design has the potential of a 20 year lifetime with over 90% AC to AC efficiency. If successful, this project leads to BESC's second generation technology which is 125kW/500kWh.

2. Collaboration

This project is in collaboration with CEC PIER. BESC received a $1.8M grant from PIER to build the flywheel. SDG&E will provide measurement and evaluation.

3. Status

PIER Funds released Q4 2012.

4. Next Steps

Wait for vendor to build the flywheel after the funds are released. It's projected to take 10+ more months to build the flywheel.

IV. New Projects in 2013

A. DR-Enabled Pool Pumps

1. Overview

The purpose of this project is to evaluate the load drop potential and effectiveness of a DR-enabling pool pump controller. The controller has been developed for use with a high-efficiency Pentair variable-speed pool pump so that the power can be ramped down during DR events. Thus, power can be shed without stopping pool volume turnover. The controller communicates via WiFi to a DRAS. Additionally, the enclosure can monitor energy consumption and transmit data to vendor servers. The vendor's future plans include development for other pumps.

2. Collaboration

The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Installations at customer homes are complete. M&V is nearing completion. Analysis is ongoing.

4. Next Steps

Pending results, final report expected Q3 2013. ETCC publication and technology transfer will follow peer review and final submission.

B. HVAC Optimization

1. Overview

The purpose of this project is to evaluate a building management system overlay that ties together HVAC, occupancy data, weather patterns, and price signals. This system leverages existing building management systems, and it is mostly used in large buildings. This software saves some HVAC energy, and reduces the peak demand of buildings by throttling air handler supply fans. In addition, it enables demand response by reducing energy automatically on a DR signal. By reducing the peak demand, customers can save around 10% on their energy bill.

2. Collaboration

The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Vendor confirmed, and two sites confirmed. To be installed soon. The two sites are both large buildings. One has a central chiller, and one has package rooftop heating, ventilation, air-conditioning (HVAC) units. Both sites do not require upgrades to install system.

4. Next Steps

Contracting and signing agreements, Installation at the two sites, Evaluation and DR test.

C. Grid-integrated Charging at the SDG&E Workplace

1. Overview

SDG&E commenced implementation of the first-of-its-kind EV Smart Charging Port designed for workplaces, multi-unit dwellings and other shared parking areas. The charging equipment is installed at SDG&E's workplace and serves SDG&E employees, plug-in electric vehicle fleet and provides a platform for demonstrations to customers interested in learning more about workplace charging solutions. The installed facility features a centralized charge control kiosk that allows for automatic response to DR program alerts, and for capturing and recording employee charging decisions based on various time-of-day pricing options. The equipment allows SDG&E to experiment with a variety of service pricing plan options, charging-load control schemes and behavioral response to variable hourly pricing based on changing electric transmission and distribution system conditions and generation resource availability and variability from renewable energy supply. This project will test new DR programs with SDG&E employees using equipment installed at company charging facilities. To accomplish this, the team included DR requirements in the planning effort to build a PV shaded parking canopy at SDG&E's headquarters facility with eight parking spaces dedicated to Level 1 (120-volt) and two parking spaces dedicated to Level 2 (240-volt) plug-in vehicle charging for employees and fleet.

These cooperative efforts among multiple SDG&E groups, and the charging facility, provide the means to accomplish the following DR related tests:

- Demonstrate effectiveness of Level 1 charging for workplace and fleet plug-in vehicles

- Develop cost-effective access control, billing and charging-control systems for potential ongoing use at SDG&E facilities – to support both fleet and employee charging (evaluate methods for adapting the system for use at customer workplaces and multi-unit dwellings)
- Demonstrate remote charging shut-off and/or load control during demand response events
- Provide a platform for demonstrating how employee charging-decisions change in response to time-variant pricing schemes and communications

2. Collaboration

The results will be shared with other IOU's during scheduled monthly conference calls. Liberty Plugs In's and Liberty Access Technologies have been instrumental in bringing this product to market. Numerous groups like the California Plug-in Electric Vehicle Collaborative and Smart City San Diego have toured the facility in an effort to work with them to communicate the project goals to their stakeholders of providing low-cost workplace charging options.

3. Status

SDG&E created plans and issued a request for proposal to construct the infrastructure for the project. Funding for the DR applications for this effort were approved in Q2 2012 of SDG&E's DR filing (spending in 2013 and 2014). Installation was completed in phases between year-end 2012 and Q1 2013, with initial operation commencing in Q2 2013 with static Time-of-Use pricing (TOU) applied. Programming for and testing of the DR applications, and day-ahead variable pricing commenced late Q2 2013, with beta testing expected in Q3 2013.

4. Next Steps

SDG&E is currently developing plans to install more charging stations at the main campus leveraging the full length of cords to provide increased access and utilization across multiple parking spaces. Several other work sites are in review to install or add charging stations. The existing access control technology will be scaled down in complexity and cost for sites that need fewer than 10 charging stations. A mobile phone and web application is in development that will allow users to select which prices and times-of-day they wish to charge. The phone and web application will also provide a means for monitoring charging and total costs for charging.

D. OpenADR 2.0 A/B Evaluation

1. Overview

Evaluate OpenADR 2.0 A/B signals for demand response, ancillary services, and real time pricing. Evaluate DR potential at site, and A/S potential at site. Send OpenADR 2.0 signals from LBNL or a certified server.

2. Collaboration

Collaboration with DRRC at LBNL. The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Contract established with DRRC at LBNL. Select site (most likely at SDG&E's EIC). Prepare system for OpenADR 2.0 A/B signals.

4. Next Steps

Select site and upgrade system for OpenADR 2.0 signals.

Budget

George Katsufrakis' May 31, 2011 testimony in the 2012 – 2014 DR proceeding (Exhibit SDGE-4), Chapter III, pages GMK-47 – GMK-50 described the activities of DR-ET.