

**DEMAND RESPONSE
EMERGING
TECHNOLOGIES
PROGRAM**

**SEMI-ANNUAL
REPORT 2014**

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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, Flywheel Energy Storage, EIC Smart Home Demonstration, DR-enabled Pool Pumps, HVAC Optimization, and Smart Grid Integration Software Project.

II. Completed Projects in Q4 2013 and Q1 2014

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

Final report completed and published to the ETCC site. The technology was presented to customer programs for review.

4. Next Steps

Offering support to customer programs and tracking changes in the industry which could assist with customer program development.

B. 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

The CEC worked with Premium Power in an attempt to complete this project during the PIER funding cycle, however Premium Power was unable to meet those deadlines with their proposed technology. Premium Power has switched to production of a different battery chemistry to bring a product to market, and will continue to research their proposed chemistry for future products. The CEC decided to cancel the project funding, and therefore the project will not be pursued.

4. Next Steps

None.

C. 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

Analysis and reporting completed.

4. Next Steps

Utilizing lessons learned for follow up project to explore OpenADR 2.0 starting in 2014.

III. Ongoing Projects in 2014

A. *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 constraints, 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

Commissioning of vendor hardware and building management system was completed. A draft report was generated and it was determined that further evaluation was needed to confirm the results. Two more tests were performed in March to get more data.

4. Next Steps

Complete evaluation. M&V, data analysis, final report, and technology transfer are scheduled for Q2 2014.

B. *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. Scheduled to upgrade the HAN equipment in the Smart Home to reflect what devices are currently commercially available.

4. Next Steps

Complete the updates to the Smart Home with a current PCT and HAN energy display device. Complete the information and demonstration about in home energy storage devices. Assist with the design of Phase II (Self-Guided Tour).

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

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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. The project is currently active with day-ahead variable pricing as of February 2014. Users are actively engaged in choosing the charging schedule using either the web-based or mobile application based methods.

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

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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. Preliminary analysis of the usage characteristics will be performed in Q2 and Q3 of 2014 along with user surveys to capture behavioral feedback.

D. 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 12+ more months to build the flywheel.

IV. New Projects in 2014

A. 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.

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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 office 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. The contracts were signed at the beginning of March, and project kickoff is scheduled.

4. Next Steps

Project kickoff scheduled for early April, to be followed by installation at the two sites, evaluation and DR testing.

B. 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 a site from SDG&E AutoDR program applicants, to follow the process of signing up for the program. Identifying equipment needed for the EIC AutoDR enablement.

4. Next Steps

Prepare EIC for AutoDR, follow the enrollment of a new building in the AutoDR program, and work with Sunverge to develop OpenADR compatibility for EIC testing.

Budget

George Katsufraakis' 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.