

**DEMAND RESPONSE
EMERGING
TECHNOLOGIES
PROGRAM**

**SEMI-ANNUAL
REPORT 2012**

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I. Summary

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

Ongoing projects include Centralized Hotel Guest Room Controls, DR in Data Centers Scoping Study, Mainstreaming AutoDR evaluation, Multivendor HAN Assessment, Zinc-Flow Energy Storage, Wireless Controls and Monitoring for Commercial Buildings (commercial DR), HAN with Communicating Power Strips, and HAN with mobile Apps, HAN with Smart Appliances.

Groundwork was laid for new activities in the following areas: Smart Grid for Buildings, as well as HAN in Smart Home, and Lighting Controls in the newly opened Energy Innovation Center Demonstration Building.

II. Completed Projects in 2012

A. *Multivendor HAN Assessment*

1. Overview

The purpose of this field demonstration is to demonstrate and evaluate technical capabilities of a multi-vendor HAN solution. This project will evaluate off-the-shelf home area network technologies used to manage customer energy usage. Each selected home will have multiple vendors' devices to evaluate technical challenges and assess interoperability. HAN connected devices will include energy management systems, plug load and appliance controllers and Programmable Communicating Thermostats (PCT's). HAN connectivity to a house electric meter will be included. Communications to the home will be through a contractor-hosted web portal with an internet gateway and a ZigBee interface to HAN connected devices. The field demonstration will include up to 12 homes.

2. Collaboration

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

3. Status

This project has been discontinued due to an unresponsive vendor. A scaled field placement test of the same technology is taking place in SDG&E that has similar scope, therefore we have not pursued continuation aggressively.

B. Home Area Network with Communicating Power Strips Assessment

1. Overview

The purpose of this project is to assess communicating power strips alongside the home area network (HAN). These DR enabled power strips will connect to the HAN, which includes a gateway, programmable communicating thermostat, customer portal, and load controllers. Emerging Technologies will measure load drop during a simulated demand response event. Also, energy efficiency using HAN with communicating powers strips will be compared to the previous years without enabling technologies. 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 IOU's during scheduled monthly conference calls.

3. Status

This Project's Final Report has been completed and delivered to SDG&E and is undergoing peer review. Technology performed well and showed potential in device monitoring/control and load drop capabilities as designed. Some reliability issues were identified and shared with the particular vendor for suggested improvement.

C. Home Area Network with Mobile Apps Assessment

1. Overview

The purpose of this project is to assess mobile apps alongside the home area network (HAN). The mobile app can access the HAN energy management system and the HAN, which includes a gateway, programmable communicating thermostat, customer portal, and load controllers. Emerging Technologies will measure load drop during a simulated demand response event. Also, energy efficiency using HAN with Mobile Apps will be compared to the previous years without enabling technologies. 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 IOU's during scheduled monthly conference calls.

3. Status

This Project's Final Report and been completed and delivered to SDG&E and is under peer review. Technology performed well and showed potential in device monitoring/control and load drop capabilities. Some usability issues were identified and shared with the particular vendor for suggested improvement.

D. Wireless Controls and Monitoring for Commercial Buildings

1. Overview

Emerging Technologies assessed a cloud-based BMS with wireless sensors that control common HVAC equipment including Air Handling Units, Chillers, Boilers, and Thermostats. The solution included an access point with a 6-mile range for easy remote access. The system included advanced algorithms for automated demand response, as well as for a chilled water temperature control method to save energy. Emerging technologies team planned to test the system at three sites this year. The sites included large commercial buildings of various types.

2. Collaboration

This project is a collaborative effort with SDG&E's Demand Response Customer Program team and Commercial Account Executives. The results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

Two out of three test sites were selected (a large resort and a local library), and the vendor installed & commissioned their technology on both. Measurement, verification, data analysis, and presentations to involved parties were completed. Energy savings were found to be unexpectedly low; as a result the vendor decided to discontinue to the product. It was therefore decided not to provide a final report of this study.

E. DR in Data Centers Scoping Study

1. Overview

The overall goal of this project is to improve the understanding of DR opportunities and automation for data centers. The specific project objectives include conducting a set of field tests to evaluate and improve the understanding of the feasibility and adoption of DR in data centers, exploring practical barriers and opportunities, and identifying perceived versus actual risks as well as methods to overcome them. With the feasibility and adoption information, the consultant will determine a set of

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potential DR strategies to manage data center loads for both site infrastructure (such as HVAC and lighting) and IT infrastructure (including servers and storage).

2. Collaboration

This project is in collaboration with PG&E. The results will be shared with other investor-owned utilities (IOUs) during scheduled monthly conference calls.

3. Status

Site has been selected. Demand Response shedding strategies have been executed.

4. Next Steps

Project complete and Report has been published.

III. Ongoing Projects in 2012 (continuing from 2011)

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 Public Interest Energy Research Program. Also, 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. Installation in 2012. Evaluation for at least a year.

4. Next Steps

Install at Site.

B. *Centralized Hotel Guest Room Controls*

1. Overview

The purpose of this assessment is to gain an understanding of the potential increases in energy efficiency and ability to participate in demand response (DR) events when a hotel uses a centrally controlled room energy management system (EMS). The product to be evaluated in a hotel in San Diego is a centrally controlled energy management system suited for the hospitality industry. The System shall include a smart digital thermostat with infrared occupancy sensor in each guest room and central interface network including server and software to enable EMS functions. The thermostat will be connected to each guest room HVAC unit. Network communications will be via cabling backbone to each guest room. The system will provide centralized control of individual room energy use based upon room sale occupancy allowing the room to be placed in a “deep” energy conservation mode when not occupied or rented and activate load shed mode during DR events.

2. Collaboration

The results will be shared with other investor-owned utilities (IOUs) during scheduled monthly conference calls.

3. Status

The report draft was completed in 2011; however some measurements turned out incomplete or inaccurate and need to be repeated. The project is waiting for summer-like weather conditions to complete measurement and verification.

4. Next Steps

Complete measurement and verification in Q3 or Q4, then update and publish final report on ETCC by Q4 and transfer technology.

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.

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2. Collaboration

This project is in collaboration with PG&E and SCE. The results will be shared with other investor-owned utilities (IOUs) during scheduled monthly conference calls.

3. Status

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

4. Next Steps

Final report and applicable technology transfer are planned for completion in 2012.

D. Home Area Network with Smart Appliances Assessment

1. Overview

The purpose of this project is to assess demand response enabled appliances alongside the home area network (HAN). Appliances include a washer, dryer, dishwasher, stove, microwave, and refrigerator. The DR enabled appliances have a communicating chip preinstalled, and they turn off features of the appliance to reduce demand instead of completely shutting of the appliance. These DR enabled appliances will connect to the HAN, which includes a gateway, programmable communicating thermostat, customer portal, and load controllers. Emerging Technologies will measure load drop during a simulated demand response event. Also, energy efficiency using HAN with Smart Appliances will be compared to the previous years without enabling technologies. 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 IOU's during scheduled monthly conference calls.

3. Status

Delivery and installation of appliances has completed. Commissioning of "smart" features and installation of PCTs is in progress, to be completed by Sept 2012, at which time evaluation begins. Early analysis shows limited DR potential from 'smart' features.

4. Next Steps

Customer surveys and on-site M&V including HAN and DR capabilities. Results will be compiled and Final Report to be completed by year end.

E. 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 IOU's during scheduled monthly conference calls.

3. Status

Vendor and host site has been selected, proposals and contracting has completed. Installation and commissioning is in progress and scheduled to be completed by Q4 2012.

4. Next Steps

Complete installation and commissioning. Begin evaluation. M&V and data analysis are scheduled to complete in 2012, final report and technology transfer are scheduled to complete in early 2013.

F. 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. The two main DR technologies that will be demonstrated will be Home Area Network 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

Evaluation in Q3 and Q4

IV. Projects initiated in 2012

A. 10 kW / 40 kWh Flywheel Energy Storage

1. Overview

Berkeley Energy Sciences Corporation is developing a low-cost Flywheel Energy Storage Device. The first generation device is 40 kWh / 10 kW. This flywheel uses high-strength steel as a rotor, and this design has a 20 year lifetime with over 90% AC to AC efficiency. 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 to be released Q4 2012.

4. Next Steps

Wait for vendor to build the flywheel after the funds are released. It will take 18-24 months to build the flywheel.

V. Budget

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