



Emerging Markets & Technology Demand Response (DR) Projects

Annual Report: 2009

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I. Summary

As described in section VIII of the Amended Testimony in Support of Southern California Edison Company's Amended Application for Approval of Demand Response Programs, Goals, and Budgets for 2009-2011 ([A.08-06-001](#)), and authorized in CPUC [Decision 09-08-027](#) Adopting Demand Response Activities and Budgets for 2009 through 2011, SCE Emerging Markets & Technology executes projects to explore innovative Demand Response (DR) technologies, understand customer preferences and market potential and provide input on DR codes and standards to enable customer participation in SCE's DR programs. This report is being submitted as directed in ordering paragraph 14 of [Decision 09-08-027](#) to provide an annual report on the projects undertaken through the Emerging Markets & Technology efforts and will be available on the [Emerging Technologies Coordinating Council](#) (ETCC) website.

In 2009 Southern California Edison (SCE) chartered emerging markets and technology projects in the following areas:

- Establishing DR capabilities in standard commercial product offerings
- Development of DR standards for buildings, appliances and messaging protocols;
- Development of tools to identify DR potential when evaluating commercial buildings;
- Research into the DR potential of consumer appliances and new construction building codes;
- Initiation of the Home Battery Pilot project;
- Enabling future Integrated Demand Side Management (IDSM) policy objectives through
 - Office of the Future project collaboration with Energy Efficiency;
 - Exploring Home Area Network capabilities for DR by participating in the Irvine Smart Grid Demonstration project;

This report summarizes the results and status for the individual projects.

II. Projects Completed in 2009

A. DR09.03 Mainstreaming Automated Demand Response (AutoDR)

1. Overview

The primary objective of this project is to mainstream Automated Demand Response (AutoDR) strategies by making AutoDR implementations a more commercial-off-the-shelf implementation instead of a highly customized solution for each customer. The project built on the SCE success from the AutoDR projects from 2007:

- [DR Enabling Technologies for Small Commercial Buildings \(LBNL\)](#)
- [Alternative Technology for Automated Demand Response \(AutoDR\)](#)

This project began in the summer of 2009 and was completed at the end of the year. The long-term goal of this project is to develop and advocate commercial building AutoDR solutions, technologies and devices that are less expensive, easy to implement and commercially available, as well as compatible with the future OpenADR standards developed by national standards organizations.

2. Collaboration

This project was discussed with the building controls industry and the Demand Response Research Center (DRRC)¹. Results were shared with PG&E and SDG&E who are interested in collaborating with SCE and DRRC on updating and maintaining the list of Auto DR compatible products and devices.

3. Results

An initial list of 35 building energy management and control systems (EMCS) from 33 different manufacturers were evaluated to determine the minimum and “nice to have²” AutoDR features and functionality included in each product. The report listing the criteria and products will be available on the [Emerging Technologies Coordinating Council](#) website³.

¹ The California Energy Commission's Public Interest Energy Research (PIER) program's Demand Response Research Center (or "Center") is led by Lawrence Berkeley National Laboratory: <http://drrc.lbl.gov/>

² Features desired but not absolutely necessary for AutoDR functionality

³ This listing is dependent on assuming SCE can determine how to provide the list in accordance with the affiliate guidelines and prohibition against product endorsement

Sixty percent of the products that were reviewed met all applicable minimum requirements to be considered AutoDR “ready”. Just over 30% of the products reviewed also included all of the “nice to have” features identified with most of the products including at least one of the three “nice to have” features. Most, if not all, manufacturers are exploring ways to ensure that their products comply with OpenADR specifications in the near future.

4. Next Steps

This project has been completed and the list of evaluated building automation systems/energy management systems will continue to be maintained and updated in the future by the DRRC in collaboration with the California IOU’s. As AutoDR compatible products become more commercially available, customer costs will decrease and more customers will benefit from participation in TA/TI and AutoDR incentive programs.

B. DR09.04 Demand Response Quick Assessment Tool (DRQAT)

1. Overview

Over the past several years, the DRRC has coordinated the development of two DR assessment tools: The Demand-Limiting Assessment Tool (DLAT) for small commercial buildings developed at Purdue University and the Demand Response Quick Assessment Tool (DRQAT) for large commercial buildings developed at Lawrence Berkeley National Laboratory. These tools and associated guides are available for download at: http://drcc.lbl.gov/tools_DRQAT_guides.html.

The primary objective of this project was to build upon previous projects related to DR assessment tools that began in 2007 and 2008:

- [DR Quick Assessment Tool for Large Commercial Buildings](#)
- [DR Assessment Tool for Small C&I Customers](#)

Efforts for this project focused on improving the existing software by incorporating a similar user interface and SCE specific rates into the assessment tools. These customizations were initiated during the summer of 2009 and completed by the end of the year. The long-term goal is to develop a comprehensive DR assessment tool for all commercial buildings that integrates SCE’s existing and future analytical tools for integrated energy management.

2. Collaboration

SCE leveraged the prior work and development of the assessment tools by DRRC. The other California IOU's are familiar with the DR assessment tools and SCE will share the feedback we receive following initial use in the field throughout 2010.

3. Results

Both the DLAT and DRQAT software applications were updated to include SCE specific rates. The DLAT was also updated with a similar user interface to the DRQAT. SCE also explored how the tools could be merged with other customer rate analysis tools such as Energy Manager.

4. Next Steps

Provide training at the beginning of Q2 2010 for the engineering firms currently involved with SCE's Technical Assistance and Technology Incentive (TA&TI) program and SCE field engineers. 2010 field trials will solicit feedback on these tools, collect any suggested improvements, and determine possible integration strategies with other existing analytical tools.

C. DR09.05 Demand Response Potential in Title 20–Phase 1

1. Overview

The primary objective of this project was to validate and establish the DR technical market potential of thirteen commercial and residential appliance categories. It is part of a multi-phase, multi-year effort beginning in 2009 to incorporate DR regulations into the California Appliance Efficiency Regulations (Title 20). Two of the appliance categories evaluated, pool pumps and ice machines, had projects completed previously that contributed to this project:

- [Pool Pump Demand Response Potential](#)
- [DR Strategies for Commercial Ice Machines](#)

2. Collaboration

This project was discussed with the DRRC and the other IOU's and interest was expressed in collaborating on a future phase of the project when DR capabilities of the most promising appliance categories and strategies will be demonstrated.

3. Results

This project was broken down into thirteen sub-projects each focused on a different appliance category. Each sub-project provided possible strategies

to be implemented and an estimate of the DR potential for each strategy based on kW reduction per unit, market size, and an estimated range for market acceptance.

The thirteen sub-projects studied were:

1. Open and Closed Refrigerated Display Cases
2. Anti-sweat Heaters on Glass Doors of Low-temperature Reach-in Display Cases
3. Refrigerated Beverage Vending Machines
4. Walk-in Coolers and Freezers
5. Reach-in Refrigerators and Freezers
6. Commercial Ice Machines
7. Hot Food Holding Cabinets
8. Residential Portable Spas
9. Residential Appliances
10. Residential Pool Pumps
11. Home Office Equipment
12. Home Entertainment Equipment
13. Laptop Batteries and Docking Stations

Phase one of this project was initiated during the summer of 2009 and completed at the end of the year. A final report provided excellent information regarding technical capabilities and estimates of the market size for each appliance category. However, additional research will be required to more accurately determine market acceptance of the different strategies described. The report is available on the Emerging Technologies Coordinating Council website: [Integration of DR into Title 20](#)

4. Next Steps

Market research will be conducted in 2010 to more accurately determine market acceptance of the DR strategies for each appliance category and estimate the market adoption and growth of new code compliant appliances. This additional research will be used to determine which strategies should have future projects to actually demonstrate DR capabilities.

D. DR09.06 Demand Response Potential in Title 24–Phase 1

1. Overview

The primary objective of this project was to validate and establish the DR technical market potential of commercial refrigeration, commercial lighting, residential control and commercial control systems. It is part of a multi-phase, multi-year effort beginning in 2009 to incorporate DR regulations into the California Building Energy Efficiency Standards (Title

24). Several previous projects provided useful data for the projects executed this year including the DR.09.03 Mainstreaming AutoDR project described earlier and the following:

- [Time Dependent Valuation of Energy Incorporating DR into Building Standards: Methodology](#)
- [Integration of Advanced DR Communications With Building Energy Management Control Systems](#)
- [Dimmable Electronic Ballast California Market Assessment](#)
- [Two-Way Connectivity with a Lighting System as a Demand Response Source](#)

2. Collaboration

This project was discussed with other IOU's and interest was expressed in collaborating on a future phase of the project when DR capabilities of the most promising control systems and strategies will be demonstrated.

3. Results

This project was broken down into four sub-projects each focused on a different type of control system. Each sub-project provided possible strategies to be implemented and an estimate of the DR potential for each strategy based on kW reduction per unit, market size, and market acceptance.

The four sub-projects studied were:

1. Commercial Refrigeration Systems
2. Commercial Indoor Lighting Systems
3. Residential Building Control Systems
4. Commercial Building Control Systems

Phase one of this project was initiated during the summer of 2009 and completed at the end of the year. A final report provided excellent information regarding technical capabilities and estimates of the market size for each type of control system, but additional research will be required to more accurately determine market acceptance of the different strategies described. The report is available on the Emerging Technologies Coordinating Council website: [Integration of DR into Title 24](#)

4. Next Steps

Market research will be conducted in 2010 to more accurately determine market acceptance of the DR strategies for each type of control system and estimate growth an adoption of these systems through new construction and retrofit. This additional research will be leveraged to prioritize field

demonstrations of the different systems to actually demonstrate DR capabilities.

III. Projects initiated in 2009

A. DR09.08 Expanding Residential Demand Response

1. Overview

SCE will be exploring how to capitalize on the Edison SmartConnect[™] metering and home area network deployment to further enable residential demand response in coordination with energy efficiency and distributed energy resources. To further this goal, Demand Response Emerging Markets & Technology provided some of the “matching funds” for the American Recovery & Reinvestment Act (ARRA) in SCE’s proposal for an Irvine Smart Grid Demonstration (ISGD) which was awarded by the [US Department of Energy \(DOE\)](#). The ISGD project will demonstrate the potential EE and DR approaches to enable Zero Net Energy (ZNE) homes targeting the years 2012 (X% better than Title 24), 2015 (Y% better than Title 24), and 2020 (Z% better than Title 24). Two major areas of this project being funded by Emerging Markets & Technology are DR potential of residential Home Area Network (HAN) devices and a Home Battery Pilot (HBP).

2. Collaboration

This project is a collaborative effort with SCE’s Transmission and Distribution Unit (TDBU).

3. Status

This project was awarded funding as part of the American Recovery and Reinvestment Act (ARRA) of 2009. The scope of this project requires collaboration between SCE TDBU and Customer Service Business Units (CSBU) and project planning is currently in progress with [Electric Power Research Institute \(EPRI\)](#) and DOE. In the meantime, technology and devices are being evaluated for inclusion in the ISGD to demonstrate the DR potential of HAN devices.

4. Next Steps

Finalize project plan for DR potential in ISGD during Q1 of 2010; select equipment to be included at each of the ZNE homes categories (2012, 2015, and 2020); complete procurement of devices to test; obtain initial Residential Energy Storage Unit devices and perform lab testing by the end of 2010.

B. DR09.02 Home Battery Pilot (HBP)

1. Overview

The primary objective of this project during 2009 was to evaluate and test automotive grade advanced lithium-ion battery modules for use in a Residential Energy Storage Unit (RESU). This project was undertaken in an effort to evaluate the potential of using in-home batteries during DR events or localized distribution constraints to decrease customer impact, while still alleviating demand on the power grid. A more detailed explanation of this project can be found in [Appendix K](#) of SCE's amended testimony regarding DR application (A.08-06-001).

Evaluation and testing of a prototype Battery Management Module was conducted in 2009 at the Pomona Electric Vehicle Technical Center (EVTC) as a precursor to the upcoming Home Battery Pilot (HBP) project which will be coordinated with the Irvine Smart Grid Demonstration (ISGD) throughout 2010 and 2011 as well as other potential locations.

2. Collaboration

This project is a collaborative effort with SCE's EVTC and results will be shared with other IOU's during scheduled monthly conference calls.

3. Status

This project required a series of tests performed at the EVTC to evaluate the cycling (charge and discharge), safety, and compatibility of multiple battery modules used with a RESU. An RFP was issued to solicit proposals for a HBP system and the vendor proposals are currently being reviewed.

4. Next Steps

Select a vendor to provide equipment for the HBP and perform lab testing by the end of 2010. Install batteries at selected ISGD locations according to the ISGD schedule during 2011.

C. DR09.09 & DR09.10 Office of the Future (OTF)

1. Overview

The objective of the Office of the Future (OTF) project is to demonstrate 25% increased energy efficiency than current Title 24 specifications through the installation of advanced lighting and control systems.

2. Collaboration

PG&E and SDG&E are also members of the Office of the Future Consortium and results of these projects will be shared during scheduled monthly conference calls.

3. Status

During 2009, several OTF sites were identified and contacted regarding participation in the project. Initial audits of existing systems were conducted and project plans were created.

4. Next Steps

Next steps for the OTF project to be completed during 2010 include finalizing customer agreements, collecting pre-retrofit power data, complete design and construction documentation, install and tune new lighting and control systems, collect post retrofit power data, train users to use lighting controls, and test demand response capabilities of the new systems.

IV. Budget

The December 2008 CPUC [Decision 08-12-038](#) Adopting Bridge Funding for 2009 Demand Response Programs allocated limited funding for SCE's 2009 Emerging Markets & Technology activities while SCE's main DR application was delayed. As a result of this financial constraint, SCE did not initiate many of the projects and initiatives that were planned in the application, as this would have resulted in committing more than the amount provided in the bridge funding decision. The August 2009 CPUC [Decision 09-08-027](#) Adopting Demand Response Activities and Budgets for 2009 Through 2011 fully funded SCE Emerging Markets & Technology activities and many of the results reported in section II of this report are the result of an ambitious schedule in the 4th quarter of 2009 to accomplish as much as possible during the remainder of the year. Full accounting expenditures are available at [SCE's 2009 Year End Report on Interruptible Load Programs and Demand Response Programs](#).

SCE will be aggressively pursuing the initiatives described in section VIII of the Amended Testimony in Support of Southern California Edison Company's Amended Application for Approval of Demand Response Programs, Goals, and Budgets for 2009-2011 ([A.08-06-001](#)) in order to achieve the desired results. However, the dates cited in the DR application (A.08-06-001) may be adjusted by up to one year due to the timing of the September 2009 CPUC decision funding EM&T activities.