



Emerging Technology Demand Response (DR) Projects Semi-Annual Report: Q1–Q2 2013

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Acronyms

AC	air conditioning
ACEEE	American Council for an Energy-Efficient Economy
ADR	automated demand response
ASHRAE	American Society of Heating and Air-Conditioning Engineers
AMI	advanced metering infrastructure
ARRA	American Recovery & Reinvestment Act
AT	Advanced Technology
BAN	building area network
BCD	Business Customer Division
BMS	building management system
CALTCP	California Lighting Contractors Training Program
CAISO	California Independent System Operator
CASE	Codes and Standards Enhancement
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CES	community energy storage
C&I	Commercial and Industrial
C&S	Codes and Standards
CP&S	Customer Programs & Services
CEC	California Energy Commission
CPUC	California Public Utilities Commission
DOE	Department of Energy
DR	demand response
DRAS	Demand Response Automated Server
DRMEC	Demand Response Measurement and Evaluation Committee
DRRC	Demand Response Research Center
DSM	Demand-Side Management
EDF	Environmental Defense Fund
EE	energy efficiency
EMS	energy management system
EM&T	Emerging Markets & Technology
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ETCC	Emerging Technologies Coordinating Council
EVTC	Electric Vehicle Test Center
FDD	fault detection and diagnostics
HAN	home area network
HVAC	heating, ventilation, and air conditioning
IALD	International Association of Lighting Designers

IDSM	Integrated Demand-Side Management
IESNA	Illuminating Engineering Society of North America
IOU	investor-owned utility
ISDG	Irvine Smart Grid Demonstration
kW	kilowatt
KYZ	KYZ is a designation given to a relay used to create pulses for electrical metering applications
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy and Environmental Design
MW	megawatt
NEEA	Northwest Energy Efficiency Alliance
NPDL	New Products Development & Launch
NYSERDA	New York State Energy Research and Development Authority
OCST	occupant controlled smart thermostat
Open ADR	Open Automated Demand Response
PCT	programmable communicating thermostat
PLS	Permanent load shift
RESU	residential energy storage unit
RFI	Request for Information
SCE	Southern California Edison Company
SEI	Sumitomo Electric Industries
SEP	smart energy profile
SONGS	San Onofre Nuclear Generating Station
TTC	Technology Test Centers
USGBC	U.S. Green Building Council
VCHP	variable capacity system heat pump
UL	Underwriters Laboratories
VRF	variable refrigerant flow
ZNE	zero net energy

1. Summary

To help realize the benefits of demand response (DR)—greater grid security and improved use of generating resources—the Emerging Markets & Technology (EM&T) program at Southern California Edison Company (SCE) executes projects to explore innovative and cost effective DR technologies. The EM&T program also works to enable customer participation in SCE’s DR programs by providing input to the Codes and Standards (C&S) program that draws on research into customer preferences and the market potential for DR.

This report on SCE’s DR activities program over the first and second quarters of 2013 is submitted as directed in California Public Utilities Commission (CPUC) Decision (D.) 12-04-045),¹ which requires the investor-owned utilities (IOUs) to submit semi-annual reports on the projects undertaken by their EM&T programs.

SCE works closely with industry groups, academic institutions, and other utilities to develop a vision for DR, identify technologies that can be leveraged for DR, and establish standards for interoperability of DR technologies. For example, EM&T employees from each of the California IOUs meet periodically to coordinate, collaborate, and share results from each IOU’s portfolio of EM&T projects. In addition, to further institutionalize and expand DR in California, SCE is involved in ongoing collaborations and research with other statewide agencies and third party stakeholders interested in DR, such as those found in the list at the end of this report.

Further, to advance acceptance and use of DR in the market, SCE communicates positive results from the EM&T program to our customers, external stakeholders, and internal stakeholders, such as account managers within the Business Customer Division (BCD), who educate and influence un-enrolled customers to enroll in DR programs and adopt DR technologies and strategies.

Following is a sampling of some of the EM&T partnership and communications approaches implemented by SCE:

- Development of customer information sheets to aid account managers in communicating the opportunities associated with DR technologies and strategies developed by the EM&T program.
- Exploration of Integrated Demand-Side Management (IDSM) opportunities through coordination and collaboration among EM&T, engineering, and other staff throughout the Customer Service New Products Development & Launch (NPDL) group and the rest of Customer Programs & Services (CP&S) organization.

¹ D.12-04-045, Decision Adopting Demand Response Activities and Budgets for 2012 through 2014: [available at: <http://docs.cpuc.ca.gov/PublishedDocs/PUBLISHED/GRAPHICS/165317.PDF>], Ordering Paragraph # 59.

- Partnerships with BCD's Technology Test Centers (TTC) and the Advanced Technology (AT) organization in Transmission & Distribution to test EM&T products and execute projects.
- Partnership with the Electric Power Research Institute (EPRI) to test and execute DR projects. Besides providing a platform for information exchange among national utilities engaged in cutting-edge DR efforts, EPRI can play a valuable role in the development of communication and protocol standards to help manufacturers ensure seamless integration of end-use devices into utility DR programs.
- Maintenance of an internal SCE EM&T Wiki with information on industry trade events attended and current projects to keep interested parties throughout SCE current.
- Periodic DR Forums & Training at SCE to communicate and coordinate DR information across the company.
- Publishing of full reports on EM&T projects on the Emerging Technologies Coordinating Council (ETCC) website², to make them available to the public. The ETCC coordinates among its members, which include the California IOUs, Sacramento Municipal Utility District (SMUD), California Energy Commission (CEC), and the CPUC, to facilitate the assessment of promising energy efficiency (EE) and DR emerging technologies that benefit California customers and respond to the initiatives outlined in the California Long Term Energy Efficiency Strategic Plan³.
- Assistance in organizing the ETCC Summit, an event held every two years to promote emerging energy technologies, by planning the DR tracks.

² Emerging Technologies Coordination Council (ETCC) website [*available at*: www.etcc-ca.com].

³ California Long Term Energy Efficiency Strategic Plan [*available at*: <http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf>].

In the first half of 2013, SCE completed, continued, and started the EM&T projects listed in the table below.

Category	Project
Standards	<ul style="list-style-type: none"> • Research into the DR potential of consumer appliances, leading to the development of new construction building codes by the CEC • Development and implementation of DR standards, such as Open Automated Demand Response 2.0 (OpenADR 2.0) for buildings, appliances, and messaging protocols • Specification development for DR-capable appliances for use by the U.S. Environmental Protection Agency (EPA) to label ENERGY STAR products • DR credit for LEED-certified buildings
Testing	<ul style="list-style-type: none"> • Field testing of various end-use appliances and controls to understand their DR capabilities • Permanent load shift (PLS) opportunities using batteries • Pilot project to test and evaluate small batteries as residential energy storage units • Establishment of DR capabilities in smart appliances
Ancillary Services	<ul style="list-style-type: none"> • Projects targeting the ancillary services market, which require quick-response DR resources
Education	<ul style="list-style-type: none"> • Education of selected professionals (lighting experts and pool pump industry) about the benefits of DR-ready products
Special Projects	<ul style="list-style-type: none"> • Mitigation of impact from permanent shutdown of two units at the San Onofre Nuclear Generating Station (SONGS) through pilots investigating a third-party thermostat and use of a home area network (HAN) to control pool pumps • Expanding residential DR in the Irvine Smart Grid Demonstration (ISGD) project

This report summarizes the results and status of all individual DR projects undertaken by SCE. The DR project numbers assigned to each project are listed for internal tracking purposes, as well as to allow their identification in the ETCC website.

2. Projects Completed Q1–Q2 2013

DR12.04 Title 24 OCST Compliance

Overview

In past funding cycles, Southern California Edison Company (SCE) funded the development of two studies⁴ to introduce occupant controlled smart thermostats (OCSTs)—formerly referred to as programmable communicating thermostats (PCTs)—into California’s Building Code, Title 24.⁵ In 2012, OCSTs were incorporated as alternatives in residential buildings and requirements for commercial buildings into the 2013 Title 24 code update.⁶ Upon completion of the Title 24 language, the California Energy Commission (CEC) continued the code update by developing Reference Appendices,⁷ which provide guidance to the public on implementing the various code measures. This project was undertaken to provide guidance and support to CEC in developing the Compliance Manual on OCST.

Collaboration

This project is being completed in cooperation with SCE’s Codes and Standards Program and in close collaboration with CEC.

Status

This project began in late 2012, once CEC adopted the code language, and SCE retained the consultant who had assisted in developing the CASE study to ensure continuity. With support from this consultant, SCE provided input and editorial content to the iterative development of the *Nonresidential Compliance Manual for the new Occupant Controlled Smart Thermostat (OCST) Specification (formerly Upgradable Setback Thermostat [UST])* as described in *2013 Building Energy Efficiency Standards Title 24 Joint Appendix 5 (JA5)*.⁸ Guidance and tools were provided to determine both OCST applicability for different building configurations and device functionality compliance.

Next Steps

This project will continue to support CEC in developing the Compliance Manuals, which must be finished in time to allow for the 2013 Title 24 code update to go into effect on January 1, 2014. SCE’s role as technical advisor/support to CEC will continue until the Compliance Manual is completed.

⁴ Impact of Programmable Communicating Thermostats on Demand Response, April 2007 [available at: <http://www.etcc-ca.com/reports/impact-programmable-communicating-thermostats-demand-response>]; Residential Programmable Communicating Thermostats Customer Satisfaction Surveys, March 2007 [available at: <http://www.etcc-ca.com/reports/residential-programmable-communicating-thermostats-customer-satisfaction-surveys>].

⁵ California’s Building Code, Title 24 [available at: <http://www.bsc.ca.gov/pubs/codeson.aspx>].

⁶ 2013 Title 24 Code Update [available at: <http://www.energy.ca.gov/title24/2013standards/>].

⁷ Title 24 Reference Appendices [available at: http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/final_rulemaking_documents/44_Final_Express_Terms/2013_JA_FINAL.pdf].

⁸ Building Energy Efficiency Standards Title 24 Joint Appendix 5 (JA5) [available at: http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/final_rulemaking_documents/44_Final_Express_Terms/2013_JA_FINAL.pdf].

3. Projects Continued Q1–Q2 2013

DR09.02 Home Battery Pilot at Irvine Smart Grid Demonstration

Overview

The primary objective of this project, which began in 2009, is to evaluate and test small (4-kilowatt [kW]) automotive-grade advanced lithium-ion battery modules for use as a residential energy storage unit (RESU). The goal is 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 K⁹ of SCE's amended testimony in support of its 2009–2011 DR application (A.08-06-001).

Collaboration

The project is a collaborative effort with SCE's Electric Vehicle Test Center (EVTC) in Pomona, California and leverages their expertise with lithium-ion batteries.

Status

The project team conducted extensive lab testing of a prototype device received from the vendor in December of 2010. During 2011, the vendor delivered 2 pre-production units and 14 additional units with increased functionality and several other improvements, including web control. These 14 production units went through the complete series of RESU tests, and SCE's energy storage specialists worked with vendor engineers to resolve issues discovered during testing. Due to a delay in Underwriters Laboratories (UL) certification, SCE filed, and received approval for, Advice Letter 2685-E¹⁰ requesting a continuation of the project into the 2012–2014 funding cycle. UL certification was received early in 2013, and several RESU units were installed as part of the Irvine Smart Grid Demonstration (ISGD) project in June 2013.

Next Steps

Testing at ISGD will begin later in 2013 and at the other sites in 2014. A final report, slated for submission in 2014, will provide information on the feasibility of using these types of batteries as a DR resource, as well as any additional project findings. Additional units will be installed in customer sites outside ISGD, including sites of small commercial customers, as the batteries become available later in 2013. The testing conducted outside of the ISGD project will be reported under a different project number in the future.

⁹ SCE's Amended Testimony in support of its 2009–2011 DR application (A.08-06-001), Appendices A through M [available at: [http://www3.sce.com/sscc/law/dis/dbattach1e.nsf/0/DBCA190DAE972CEB882574C90070C520/\\$FILE/A.08-06-001+2009-11+DR+Amended+App_SCE-04++Appendices+A-M.pdf](http://www3.sce.com/sscc/law/dis/dbattach1e.nsf/0/DBCA190DAE972CEB882574C90070C520/$FILE/A.08-06-001+2009-11+DR+Amended+App_SCE-04++Appendices+A-M.pdf)], pp. 449–455].

¹⁰ AL 2685-E [available at: <https://www.sce.com/NR/sc3/tm2/pdf/2685-E.pdf>].

DR09.08 Expanding Residential DR in the Irvine Smart Grid Demonstration

Overview

SCE has been exploring how to capitalize on the Edison SmartConnect™ metering and home area network (HAN) deployment to further enable residential DR in coordination with energy efficiency (EE) and distributed energy resources. To further this goal, the EM&T program provided some of the matching funds - in SCE's proposal for the ISGD project - that allowed SCE to leverage funding from the American Recovery & Reinvestment Act (ARRA) awarded to SCE by the U.S. Department of Energy (DOE)¹¹ in 2010. The ISGD project will demonstrate the potential EE and DR approaches to designing zero net energy (ZNE) homes, in step with California's Long Term Energy Efficiency Strategic Plan.

Within the ISGD project as a whole, this specific demonstration (Project DR09.08) will focus on residential DR by examining various treatments to three separate groups of homes: a community energy storage (CES) block, a ZNE block (that also uses energy storage), and an RESU block. All the homes will receive communicating thermostats, energy information displays, and smart appliances. A variety of DR experiments will be conducted to evaluate the use of SCE's advanced metering infrastructure (AMI) network and load control systems, as well as the effectiveness of residential DR utilizing a HAN.

Collaboration

This project is a collaborative effort with SCE's Advanced Technology (AT) organization. It also collaborates with DOE in support of their larger Smart Grid demonstration efforts.

Status

The HAN devices installed as part of the early field test have continued to be monitored. An update to the system to enable testing of DR events caused a delay in the DR testing planned for 2012. Due to this and other delays, SCE filed, and received approval for, Advice Letter 2685-E, requesting a continuation of the project into the 2012–2014 funding cycle. All HAN devices were installed during June of 2013, and an initial test was completed successfully. Plans are underway to schedule DR tests throughout the remainder of the summer months of 2013.

Next Steps

Planned experiments will be conducted and results monitored throughout the remainder of the summer months of 2013, and a final report will be prepared in 2014.

¹¹ U.S. Department of Energy Recovery Act State Memos [*available at*: http://energy.gov/sites/prod/files/edg/recovery/documents/Recovery_Act_Memo_California.pdf].

DR10.16 Smart Appliances

Overview

This project performs laboratory testing of various smart appliances from different manufacturers to quantify the load curtailment potential of these appliances during DR events. These tests are conducted in a controlled environment and provide an opportunity to observe how smart appliances react to price and reliability DR event signals. Further, study results can inform various DR-capable appliance efforts currently underway (such as development of the ENERGY STAR “Connected” appliance specification). The table below shows the unique project number associated with a given manufacturer and appliance.

Appliance	Manufacturer A	Manufacturer B	Manufacturer C
Testing and Reports Completed in 2012 and Prior Years			
Refrigerator/Freezer		10.16.RF-B	
Clothes Washer	10.16.CW-A	10.16.CW-B	
Dishwasher	10.16.DW-A		
Testing to Be Started or Completed in 2013			
Refrigerator/Freezer	10.16.RF-A		10.16.RF-C
Clothes Washer			10.16.CW-C
Dishwasher			

Collaboration

This project is a collaborative effort with several major appliance manufacturers to test the DR potential of smart appliances utilizing SCE’s Technology Test Centers (TTC) laboratory facilities and staff.

Status

As the table above shows, TTC has completed testing and has prepared technical reports for one refrigerator (manufacturer B), two clothes washers (manufacturers A & B), and one dishwasher (manufacturer A). Results of these completed tests have been shared in several public forums, including the 2012 American Council for an Energy-Efficient Economy (ACEEE) Summer Study¹² and the 2013 American Society of Heating and Air-Conditioning Engineers (ASHRAE) Annual Conference.¹³ In July 2013, testing was completed on a second refrigerator (manufacturer A).

Next Steps

Data analysis and a technical report for the second refrigerator (10.16.RF-A) are expected to be completed in Q3. One additional refrigerator (10.16.RF-C) and a clothes washer (10.16.CW-C) from the third manufacturer have been received and are scheduled for testing to begin later in 2013. In an effort to provide comprehensive analysis, a final report compiling data collected from all the tests will be prepared at the conclusion of testing all appliances.

¹² Energy-Efficiency Economy (ACEEE) Summer Study [more information available at: <http://aceee.org/conferences/2012/ssb>].

¹³ 2013 American Society of Heating and Air-Conditioning Engineers (ASHRAE) Annual Conference [more information available at: <http://ashraem.confex.com/ashraem/s13/cfp.cgi>].

DR12.01 Demand Response Opportunities with a Permanent Load Shift System

Overview

Electrical energy storage–based permanent load shifting (PLS) devices, such as batteries, are still an emerging technology. Besides shifting load, a PLS device could be used to provide DR response resources, such as local voltage regulation support for distributed generation resources and short-term ancillary services. This project will find a commercial site in which to field test an advanced PLS system that may supply all or part of the site’s load, and will have advanced controls to allow the implementation and testing of various advanced DR scenarios, as well as traditional PLS capabilities.

This project will identify the technical requirements needed to enhance the capabilities of a battery-based PLS to perform additional DR functionality, as well as investigate and define telemetry and control requirements. It will also help identify and develop recommendations for any regulatory enhancements necessary to allow the installation of enhanced DR-compatible PLS at a site. At the conclusion of the project, a final report with the findings of this work will be completed and shared.

Collaboration

This project is being executed by SCE’s Demand-Side Management (DSM) Engineering group, with support from the EVTC organization.

Status

A demonstration site has been selected, and the SCE customer located at that site has agreed to participate in the project. SCE recently completed the bidding process for the vendor of the PLS system and has selected the winning proposal. Currently, SCE is in the procurement process phase.

Next Steps

Next steps include developing a battery energy storage system design suitable for the demonstration site, factory acceptance tests, installation, a site acceptance test, commissioning, data collection and analysis, and reporting. This multi-year project is on track for completion by the end of 2014.

DR12.03.02 Lighting Professional Certification Training Program

Overview

Lighting designers, engineers, and architects often have difficulty keeping current with the rapid development of DR-capable lighting systems. This program intends to fill this knowledge gap by developing training curriculum and certification testing for lighting professionals on the design and selection of DR-capable lighting systems with advanced controls.

The first phase of this program (DR12.03) evaluated the job types and knowledge needed for an effective training and certification program. Efforts in 2013 are integrating the research and qualified steps from the first phase job analysis and body of knowledge documents to develop and deliver a focused training curriculum, classes, and tests for lighting professionals, with the goal of paving the way for future industry-supported advanced DR lighting design certification programs.

Collaboration

This project leveraged the format and structure of the successful California Lighting Contractors Training Program (CALCTP) and included the financial participation of members of the West Coast Lighting Consortium. The success of CALCTP allowed for continued collaboration with the Illuminating Engineering Society of North America (IESNA) and the International Association of Lighting Designers (IALD). The following organizations participated in this project:

- New York State Energy Research and Development Authority (NYSERDA)
- Consolidated Edison of New York
- Northwest Energy Efficiency Alliance (NEEA)
- National Grid
- NSTAR
- Sempra
- Pacific Gas and Electric
- Southern California Edison Emerging Technologies group
- Southern California Edison Codes and Standards group

Status

The 2013 Curriculum Committee has developed curriculum guidelines for a focused class on quality lighting, efficiency, and controls. This work will lead to the development of a variety of materials, such as text, graphics, speaker notes, presentations, handouts, homework, and labs, and will culminate in alpha and beta testing at the end of 2013.

Next Steps

The Curriculum Committee is finalizing the curriculum draft in order to conduct the beta test. The materials will be reviewed to affirm that they are following approved adult learning guidelines. Instructor protocols and deliverables will be executed in classroom settings. The project is expected to be completed by the end of 2013.

DR12.07 Demand Response Partnership Program (DRPP)

Overview

As a result of efforts by the investor-owned utilities (IOUs) and Lawrence Berkeley National Laboratory (LBNL), automated DR is being piloted as a point for Leadership in Energy and Environmental Design (LEED) for both new and existing non-residential buildings. This pilot is designed to encourage building owners to add DR capabilities to their facilities by offering LEED DR credit if adopted.

It is estimated that 58% of the some 1,400 LEED-certified buildings in SCE's service territory, representing 18 million square feet, could earn the LEED DR credit immediately. Demand reduction will vary by building size and type. However, the initial requirement of the LEED DR point is to achieve a minimum reduction in peak energy use of 10% or 20 kW, whichever is greater.

The goal of this program is to show that establishing this LEED DR credit will be seen as a benefit by the building owner, decrease energy use, and help stimulate expanded development of DR technologies.

Collaboration

SCE has collaborated with the U.S. Green Building Council (USGBC), the Environmental Defense Fund (EDF), and the Demand Response Research Center (DRRC) at LBNL to complete the project objective of refining the LEED DR credit. Tasks include reaching out to LEED-certified building owners through telephone, webinars, and USGBC meetings and researching the effects of the credit availability on market adoption, grid reliability, and overall environmental impact. Internally, EM&T program staff will be working with SCE's account managers, New Construction Services, and Regulatory Special Projects to achieve this project's objectives.

Status

The project's customer outreach phase identified and contacted over 300 SCE customers who are USGBC members. This sampling has targeted customers in the middle of their first LEED certification or pursuing LEED points to reach the next level of certification. Research data are being collected on building profiles, DR readiness, and LEED DR credit acceptance.

Next Steps

SCE expects the project to continue throughout 2013, with a final report prepared at the end of the project by Q4 2013.

DR12.08 DR Pool Pumps

Overview

The purpose of this project¹⁴ is to perform laboratory and field tests of commercially available pool pumps and pool pump controllers designed to enable curtailment of pool pump loads in response to DR event (curtailment) or pricing signals. This work is a follow-up to prior studies that estimated the potential for residential pool pumps to act as a DR resource: Pool Pump Demand Response Potential¹⁵ and Integration of DR into Title 20 for Residential Pool Pumps.¹⁶

This project will include field trials of a pool pump with integrated DR capabilities to assess functionality (DR12.08.01), as well as retrofit solutions that would add DR capabilities to existing pool pumps (DR12.08.02).

Collaboration

This project is being conducted in collaboration with SCE's AT organization.

Status

DR12.08.01 ZigBee-Based DR Residential Pool Pumps

After the completion of laboratory testing of the prototype at SCE's HAN lab, the pool pump controller received ZigBee Smart Energy Certification, and the SCE HAN has the production-ready device for final laboratory testing. SCE filed, and received approval for, Advice Letter 2685-E, requesting a continuation of the project into the 2012–2014 funding cycle. The testing is expected to be completed in Q1 2014.

DR12.08.02 DR-Ready Pool Pumps for Residential Retrofit

Retrofit solutions compatible with any existing pool pumps were identified in early 2012. Field testing of these solutions is underway at customer locations. The testing is expected to be completed in Q1 2014.

Next Steps

Next steps include completing the field trial and testing of the production-ready integrated pool pump controller device and retrofit pool pump solutions according to plans, and preparing reports that document the results for each solution.

¹⁴ Reported as DR10.08 in SCE's Semi-Annual Q3–4 2012 EM&T Report.

¹⁵ Pool Pump Demand Response Potential [available at: www.etcc-ca.com/reports/pool-pump-demand-response-potential].

¹⁶ Integration of DR into Title 20 for Residential Pool Pumps - Phase 1 [available at: www.etcc-ca.com/reports/integration-dr-title-20-residential-pool-pumps-phase-1].

DR12.09 Augmenting AMI DR with Broadband

Overview

According to the U.S. Census, 63.5% of U.S. households in 2009 had broadband internet access. This high capacity access, along with the anticipated release of Smart Energy Profile 2.0 (SEP 2.0)—a standard protocol that will connect smart energy devices in a home to the Smart Grid—will enable implementation of the AMI over a significant new pathway: broadband. This project is designed to enhance our understanding of broadband’s potential for delivering DR signals by conducting the following tasks:

- Investigate the broadband communication path
- Identify SEP 2.0 gateways that can bridge Smart Meters and the internet to various devices and protocols
- Identify SEP 2.0 HAN devices for DR

Collaboration

This project is being completed in cooperation with SCE’s AT organization.

Status

In 2012, the project team identified requirements for SEP 2.0 application layer gateway products and sent a Request for Information (RFI) to vendors deemed able to provide these gateways. Early in 2013, the team began collaborating with two selected vendors to design and develop the gateway. AT engineers focused their efforts on the procurement and development of SEP 2.0 test tools, test cases, and laboratory test procedures. Shifting focus to acquiring SEP 2.0 HAN devices, the team then issued an RFI to more than 10 ZigBee or Wi-Fi OCST (also known as PCT) vendors.

Next Steps

Future plans call for working with a selected vendor to evaluate the use of a SEP2.0 iPad client for use in the Q4 2013 field test. The project team is also continuing to procure required test tools and planning for a demonstration in 10–50 customer homes. This demonstration is expected to be completed by end of 2014, pending the availability of certified SEP 2.0 products.

DR12.25 Ancillary Services Pumping Equipment

Overview

This project¹⁷ aims to evaluate the potential for customers with pumping equipment to participate in an Ancillary Services DR program. Planning for this project began in 2010 and included market research to determine customer willingness to participate in a program that has short event notifications and durations (e.g., customers must respond within 10 minutes, and the events last no longer than 30 minutes). Market research completed by BPL Global recommended that SCE pursue an Ancillary Services DR program for pumping customers to potentially replace or complement the existing Agricultural Pumping Interruptible DR program, which is subject to a megawatt (MW) limit on the amount of emergency DR statewide. According to initial projections, by 2014 approximately 6% of Agricultural and Pumping customers could be participating in an Ancillary Services program.

Collaboration

This project is being conducted in collaboration with SCE's Energy Education Center-Tulare, Field Engineering, and the Meter Services Organization.

Status

Vendors that provide field communication systems have been identified and the capabilities of each potential solution have been evaluated. A vendor was selected for the project, and a field test site was selected and visited by the SCE project team. In addition, a customer agreement has been reviewed and signed.

Next Steps

This project will be implemented in several phases. Each phase will test different communication methods and increasing levels of integration with SCE's DR open source capabilities and future programs (Ancillary Services). Equipment installation and project completion is planned before the end of 2013.

¹⁷ Reported as DR11.01 in SCE's Semi-Annual Q3-4 2012 EM&T Report.

DR12.26 Third-Party Programmable Communicating Thermostat Pilot

Overview

This field study is designed to evaluate the potential of leveraging the existing installed base of Internet-controlled OCSTs from third parties (including thermostat manufacturers and security companies) that already have the ability to communicate via the Internet (broadband) with their customers. Such new technology options may increase the ease of use and lower the cost for customers to shed load rapidly during hot summer periods when the demand for power could exceed supply—days SCE designates as “Save Power Days.” As part of this project, SCE’s existing Demand Response Automated Server (DRAS) will be used to initiate DR events using OpenADR to communicate over the internet to the third parties participating in the study.

SCE has targeted third party vendors whose customers are also SCE customers. These vendors enter into agreements with customers who own OCSTs which authorize the vendor to remotely adjust the OCST to reduce energy use during peak hours on Save Power Days. Vendors are required to notify customers that they will be adjusting the OCST by 2:30 pm on the day before the Save Power Day, and customers can manually override the remote adjustment at any time.

The agreement also provides the customer’s permission for SCE to release customer meter usage and billing data to the vendor. This data is to be used by the vendor for the singular purpose of developing proprietary algorithms that enable more effective remote management of the OCSTs in order to achieve the ideal goal of supporting peak demand management while still achieving cost-effective cooling of the customer’s home.

The test is scheduled to run during peak hours on Save Power Days from June 1 through October 1, 2013. Project goals are to obtain agreements with 3,000 residential customers to provide the potential to shed up to 4.7 MW of peak energy use.

Collaboration

To complete this project, SCE has contracted with several vendors: one which created a smart OCST; one to provide a software platform and dealer based network of smart devices for managing energy use; and a third vendor to test energy management software for Android applications with about 100 of its employees who are also SCE residential customers.

Status

The project was initiated in Q3–4 of 2012. As of July 2013, the three vendors had collectively signed up nearly 2,800 residential customers, reaching about 78% of the project’s target. As SCE designates additional Save Power Days, these vendors will test their ability to shed customer load, gauge customer satisfaction with the process, and ascertain if and why any customers opt out of an event or the program overall.

Next Steps

The third-party vendors will report their findings to SCE by the end of 2013. After reviewing results, a formal Evaluation Report will be prepared and presented to the DRMEC, where SCE will seek approval to include third party internet-controlled OCSTs in future load-reduction programs and complete and deliver its Load Evaluation Report by the end of Q1-2014.

DR12.27 Pool Pump DR Education

Overview

This project will leverage existing EE efforts to educate members of the pool and spa industry about the benefits of running pool pumps primarily during off-peak times in an effort to alleviate potential peak time grid constraints, especially on hot summer afternoons. Specifically, this project seeks to evaluate the effectiveness of offering a \$50 per pump incentive to pool maintenance companies to educate pool owners about the benefits of shifting pumping to off-peak times.

Collaboration

This project is being conducted in collaboration with SCE's EE group.

Status

The planning for this project began during the second half of 2012, and it was included as one of several studies proposed in SCE's Application Proposing Improvements and Augmentations to its Existing Demand Response Program Portfolio for the Summers of 2013 and 2014.¹⁸ SCE received approval to go ahead with the study in April 2013,¹⁹ and launched the program in August 2013.

Next Steps

Efforts during the remainder of 2013 will focus on variable-speed pool pumps that were previously installed as part of EE programs. Efforts during 2014 will focus on new installations using SCE's existing pool pump incentive programs. Results will be monitored and reported in future Semi Annual EM&T reports in an effort to improve current and future EE and DR programs.

¹⁸ CPUC proceeding A.12-12-017.

¹⁹ D.13-04-017. [available at: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M064/K342/64342913.PDF>].

DR12.28 DR Pool Pump Study

Overview

This project will leverage past research projects as well as the efforts from the ongoing DR Pool Pumps project previously described,²⁰ to expand initial field trials to a larger population and help alleviate grid constraints caused by the shutdown of two units at the San Onofre Nuclear Generating Station (SONGS). The study will utilize HAN pool pump controllers that can initiate DR events using SCE's AMI network and SmartConnect meters to curtail or shift electric loads caused by pool pumps. SCE will also test whether pay-for-performance tariffs, such as Peak Time Rebate (PTR) with enabling technology, might serve as an adequate incentive for customers to participate.

Collaboration

This project is being conducted in collaboration with SCE's Marketing and Rate Service organization, and involves partnering with several third party vendors to provide the pool pump control equipment and installation.

Status

The planning for this project began during the second half of 2012, and it was included as one of several studies proposed in SCE's Application Proposing Improvements and Augmentations to its Existing Demand Response Program Portfolio for the Summers of 2013 and 2014.²¹ SCE received approval to go ahead with the study in April 2013,²² and subsequently launched the project, with an equipment vendor identified and products currently under test. A new DR project²³ is being developed for the performance of DR tests during the pilot phase of this project. Customer recruitment and equipment installation plans are being finalized with plans to launch the pilot in September 2013.

Next Steps

As next steps, the project will enroll customers in the study, install the control equipment, conduct test events during the remainder of 2013, analyze results, and prepare a final report in 2014.

²⁰ Project DR12.08 (formerly DR10.08), described above at p. 12.

²¹ CPUC proceeding A.12-12-017.

²² D.13-04-017. [available at:

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M064/K342/64342913.PDF>].

²³ This project will be described in more detail in the next Semi-Annual Report

DR12.29 KYZ Ancillary Services Gateway

Overview

This project, which was initiated in late 2012, is intended to demonstrate a low-cost telemetry solution that will provide energy usage for future ancillary services (quick-response/short-duration) programs. It utilizes a gateway device to collect KYZ pulses (used to transmit instantaneous energy usage information) from meters and transfer data to a DRAS that can act as an aggregation point to collect energy usage information and potentially send it to the California Independent System Operator (CAISO). Proving lower-cost telemetry solutions could enable more customers to participate in ancillary service programs and allow for these programs to be available to smaller customers.

Status

An updated installation schematic to test the interoperability of devices from multiple vendors has been created. A revised scope must be developed and a customer site confirmed before moving forward on the project.

Next Steps

SCE plans to finalize the site installation schematic and revised project scope in Q3 2013. Following scope revision, SCE will request a vendor proposal, obtain budget approvals, and complete customer engagement activities. SCE will procure the necessary equipment, enroll customer participation, and install the needed equipment during Q4 2013. Telemetry data recording will be initiated in Q4 2013 and a final report will be provided by Q2 2014.

DR12.30 Smart Energy Profile Ancillary Services Gateway

Overview

Initiated in late 2012, this project applies the same concept as DR12.29, described above, but utilizes a gateway capable of gathering telemetry information from a SmartConnect meter using ZigBee Smart Energy Profile 2 (SEP 2.0) through the HAN rather than converting KYZ pulses. The architecture will still utilize a DRAS as the aggregation point. The project aims to demonstrate use of a broadband/ZigBee gateway capable of meeting the CAISO's requirements for DR bidding of sub-200 kW commercial and industrial DR loads into ancillary service markets. The project will be executed in two phases:

- **Phase 1 – Lab Testing** will evaluate gateway and DRAS connectivity and telemetry in SCE's Advanced Technology Labs
- **Phase 2 – Field Testing** will aim to demonstrate successful use of technologies in up to two commercial and industrial (C&I) sites for a period of two weeks

Collaboration

This project is being conducted in collaboration with SCE's AT and Meter Services Organization groups, leveraging their expertise with SmartConnect meters and OpenADR 2.0 testing.

Status

A telemetry gateway with the required functionality was identified and acquired by the HAN lab for testing. After being temporarily placed on hold, the project was recently re-launched. The project team is currently re-defining business and technical requirements and architecture.

Next Steps

Future steps include development of test case selection of the DRAS. In addition, the project team will commence recruitment of two appropriate customer sites, a process that includes conducting site surveys, obtaining customer approvals, and installing project equipment. Due to project delays, it is expected that a final report will be developed by Q2 2014.

4. Projects Initiated Q1–Q2 2013

DR12.13 AutoDR Programmable Communicating Thermostat: Phase 2

Overview

This project is intended as a follow-up to the Auto-DR OCST using OpenADR 1.0 project, completed in 2012.²⁴ The current project will demonstrate the capability of an OCST using Auto-DR through the OpenADR 2.0 specification, a solution intended for commercial customers without a building management system (BMS) or energy management system (EMS). The project goal is to offer a solution that provides C&I customers some automated air-conditioning load reduction during dynamic pricing or other DR events by enabling temperature setbacks without requiring installation of full—and expensive—BMS/EMS.

As part of the project, SCE's existing DRAS will be utilized to initiate DR events using OpenADR to send signals to the OCSTs over the internet to provide load drop.

Status

The planning for this project began during the second half of 2012. Customer agreements were signed and equipment was procured and installed at the customer sites in early 2013. Demand response test events were sent to the enrolled customer sites, and data were collected for these events.

Next Steps

Next steps include final verification of the data collected at the customer site for the scheduled DR events, analysis of the data, and preparation of a final report in 2013. A successful outcome of this phase of the project should result in the future adoption of OpenADR thermostats as a DR solution for small C&I customers.

²⁴ Reported as DR10.05 in SCE's Semi-Annual Q3–4 2012 EM&T Report.

DR12.16 Field Testing of Commercial Variable Heat Pump Systems

Overview

This field study is evaluating the potential of variable capacity heat pump (VCHP) systems that have the ability to use smart integrated controls, variable-speed drives, refrigerant piping, and heat recovery to provide any products that can be controlled by a smart thermostat with attributes that include high energy efficiency, flexible operation, ease of installation, low noise, zone control, and comfort using all-electric technology.

To use variable refrigerant flow (VRF) systems as a DR tool, the indoor units in one or more spaces of a building could be turned off, allowing the space temperature and humidity to drift (with some spillover of cool air from adjacent air-conditioned spaces). The on-off sequencing between zones could be alternated to minimize temperature changes, which in turn minimizes occupant discomfort. Alternatively, units could be operated at a fraction of normal capacity to maintain minimally effective environmental conditions in the occupied space. It is also possible to start the building's outdoor units sequentially to spread out demand spikes caused by starting-power transients.

This project is intended to assess the ability of a building's installed energy management systems to serve as an available resource for load management. This involves simulating load-shedding events to trigger the VCHP's built-in DR algorithm. It will conduct DR tests in field installations and in a controlled laboratory environment on EPRI's four-zone VRF testing stand.

Collaboration

This project is being conducted in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

The planning for this project began during Q4 of 2012, and the project study commenced in January 2013. The customer site has been selected, and design and implementation is in the planning stages.

Next Steps

SCE plans to install the equipment and engage the manufacturer with equipment hardware prior to summer 2013. Field tests are planned for the summer months of 2013 and 2014 after which SCE will analyze the results, and complete a final report in Q3 2014.

DR12.17 Field Testing of Climate-Appropriate Air Conditioning Systems

Overview

This project is a field study evaluating the potential and current DR capabilities of climate-appropriate air-conditioning (AC) systems (such as evaporative cooling). Targeted DR and EE programs can help reduce high peak demand caused by increased AC use and address uncertainties with respect to generation and consumption caused by extreme weather conditions. This field study will analyze how automated and optimized DR technology can build and implement accurate relationships between DR lead time, customer incentives, DR duration, external environmental conditions, and building occupancy by understanding a building's heating, ventilation, and air conditioning (HVAC) capacity and thermal characteristics.

Collaboration

This project is being conducted in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

The planning for this project began during Q4 of 2012, and the project study commenced in January 2013. The design team is in the process of developing a matrix of technologies to be installed.

Next Steps

SCE plans to install the equipment and engage the manufacturer with equipment hardware prior to summer 2013. Field tests are planned for the summer months of 2013 and 2014, after which SCE will analyze the results, and complete a final report in Q3 2014.

DR12.18 Analysis of Next-Generation Home/Building Energy Management Systems

Overview

This project involves research into the next generation of HAN and building area network (BAN) energy management and control systems for residential and small commercial customer applications. To this end, the project will collect and incorporate research information on existing and documented installations with HAN/BAN technologies from domestic and international research organizations, utilities, manufacturers, and distributors. As part of this project, a HAN/BAN system will be identified for a future field evaluation to assess its effectiveness in implementing EE and DR measures.

Collaboration

This project is being conducted in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

The research on new and upcoming technologies has been completed by evaluating over 50 technology providers. A system has been identified for future field demonstration (see DR12.19, described below) by determining utility EE and DR program requirements and identifying the potential for integrating such services as energy management, security, entertainment, and building automation. The project was initiated in November 2012, but the bulk of the work to date was completed in Q1–Q2 of 2013.

Next Steps

EPRI and SCE are currently working on analyzing and cataloguing the information collected from this research project. A final report is expected to be completed by Q3 2013.

DR12.19 Field Testing of HAN/BAN Systems for Fault Detection and Diagnostics

Overview

This project will leverage the efforts from DR12.18, Analysis of Next-Generation Home/Building Energy Management Systems, described above, to conduct a laboratory and field evaluation of a HAN/BAN system to assess the system's effectiveness in implementing utility DR programs. Additionally, the HAN/BAN system will be evaluated with residential and light commercial HVAC systems to collect, display, and communicate system fault detection and diagnostics (FDD) information. HAN/BAN system control and automation functionality will be explored to determine the potential for automatic response to FDD signals as a means to optimize HVAC system performance.

Collaboration

This project is being conducted in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

This project has identified an HVAC system with advanced FDD functionality and a HAN/BAN system. Initial technology evaluation of existing and upcoming technologies indicated that some additional technology development is needed to effectively communicate FDD signals within a HAN/BAN system as well as to third party service providers via cloud-based communication technologies. SCE is working in collaboration with an HVAC system supplier to close the technology gaps.

Next Steps

A laboratory test will be performed in the second half of 2013 to demonstrate proof of concept and identify any additional technology developments that might be necessary for field demonstration under real-life conditions. The project is expected to be completed by Q2 2014.

DR12.20 Evaluation of Permanent Load Shift Solutions for Integrated Demand-Side Management

Overview

Many different energy storage technologies aim to permanently reshape the building load profile—and particularly to achieve PLS, which consists of shifting peak-hour loads to non-peaking hours on a daily basis. Well-established strategies and programs enable individual technologies to provide PLS. However, an optimal PLS solution—based on a combination of active electrical energy storage, active thermal storage, passive building thermal storage, and variable HVAC with advanced building control technologies—has yet to be discovered. Therefore, this project aims to understand synergies between various PLS technologies to determine if optimal PLS systems per building type (such as small office buildings, restaurants, small retail stores, convenience stores, small data centers, and grocery stores) can be attained that meet economic, environmental, and technology maturity considerations.

Collaboration

This project is being executed in collaboration with SCE's DSM Engineering group, as well as EPRI, which conducts research on issues related to the electric power industry.

Status

The project is developing the technical, economic, and environmental value requirements for PLS applications and evaluating commercially available PLS technologies.

Next Steps

Next steps include conducting energy analysis for the various energy storage solutions in six different building types using whole building energy simulation models; developing building energy management control strategies; conducting a field evaluation; testing; and reporting. This multi-year project is scheduled for completion by the end of 2014.

DR12.21 Field Testing of DR Ready End-Use Devices

Overview

New DR-ready end-use devices, including appliances, are being introduced into the market. This project, a part of EPRI Subproject G, is selecting and testing a sample of these technologies, both in the lab and in the field, to determine the ability of these technologies to meet SCE's demand-reduction objectives.

Collaboration

This project is co-funded by SCE's Emerging Technologies Program as part of the EE Buildings contract with EPRI. The selection and testing will be done in coordination with the following:

- EPRI Subproject C on next generation home and building energy management systems
- EPRI Subproject D on evaluation of HANs that can provide HVAC fault detection and diagnostics

Status

The project officially began in Q1 2013 (although some preliminary work was completed in Q4 2012). The project team has developed an online questionnaire for customers regarding SCE's objectives for using DR-ready technologies. Final steps include data collection, analysis, and summary presentation of responses.

EPRI will develop tables for mapping end-use response patterns and the load shape impact objectives.

Next Steps

The project team will evaluate commercially available end-use devices with DR capabilities and latest trends in technologies in this area. EPRI will develop a list of available DR-ready end-use devices which support SCE's DR-ready objectives. The project is scheduled to be completed by Q2 2014.

DR12.40 Field Testing of Occupancy-Based Guest Room Controls

Overview

An occupancy-based guestroom Energy Management System senses when a hotel room is occupied and adjusts the energy systems—such as HVAC, lighting, and outlets—accordingly to save energy. These occupancy-based control products have central control capabilities that could be used for DR. However, implementing this capability requires additional investment in software and communications. Further, hotels and motels have generally been reluctant to implement DR measures in guestrooms due to concerns about inconveniencing guests.

Collaboration

This project is being conducted in collaboration with SCE's AT group to leverage their expertise. It will also involve partnering with several third party vendors to provide the guest room controls equipment and installation.

Status

The project began in Q1 of 2013. Customer sites have been identified, customer agreements have been signed, and the project is scheduled to be completed by the end of 2013.

Next Steps

SCE plans to install equipment, engage the manufacturer with equipment hardware, and conduct field tests during the summer months of 2013.

DR13.01 ENERGY STAR “Connected” Specifications for Residential Products

Overview

This project covers SCE involvement in the U.S. Environmental Protection Agency’s (EPA) specification development for “Connected” ENERGY STAR products. ENERGY STAR typically recognizes products with the top in-class energy performance by allowing them to display the ENERGY STAR logo on the product and use it in advertising campaigns. Manufacturers voluntarily participate by investing the resources required to design more efficient equipment than their competitors. This program is well known in the United States as well as internationally.

In response to the emerging importance of the Smart Grid and recognizing the need for compatible end-use products, in 2011 the EPA began discussions centered on including “Connected” criteria into existing product specifications. “Connected” criteria, which include such functions as communication between a device and the utility and DR capability, represent a significant deviation from ENERGY STAR’s historic energy performance realm.

To develop devices that meet “Connected” criteria, developers must define how the products communicate with a utility communication network, what types of signals will be transmitted, and the required responses to those signals. They must also create a test method to verify that the functionality exists. Each of these items has many nuances that can affect how utilities design and deploy programs around these capabilities.

Furthermore, history has shown that ENERGY STAR specifications and test methods²⁵ often are incorporated in whole or in part into mandatory performance standards adopted by the U.S. Department of Energy (DOE) or state agencies, such as the California Energy Commission (CEC). Thus, it is important to ensure that technical issues are resolved before the specifications and test methods are put into practice and become the industry standard.

As a participant in the specification and test method development processes, SCE seeks to achieve several objectives:

- Inform the EPA on the technical abilities of Smart Meters and the implications of using various communication schemes
- Provide insight into how DR event definitions play into SCE’s vision of its overall DR strategy
- Share SCE’s laboratory and field test data on various DR-capable appliances and products
- Comment on the DR verification test methods based on prior lab experience, as well as alignment with eventual DR program deployments

25 ENERGY STAR Specifications and Test Methods:

[specification information available at: https://www.energystar.gov/products/specs/product-specifications-filtered?field_status_value%5B%5D=Under+Revision&field_effective_start_date_value%5Bvalue%5D%5Bdate%5D=&field_effective_start_date_value%5Bvalue%5D%5Bdate%5D=&=Apply].

This project is divided into four sub-projects; each addressing a specific product, as shown in the table below.

Product	Project #
Refrigerators/Freezers	13.01.01
Clothes Washers	13.01.02
Climate Control	13.01.03
Pool Pumps	13.01.04

Collaboration

This project is funding SCE's portion of a collaborative specification development process with multiple interested parties, such as manufacturers, efficiency advocates, utilities, and regulatory agencies.

Status

13.01.01 – Refrigerators/Freezers

The final specification and test method for refrigerators/freezers²⁶ were published in May 2013. SCE provided several sets of written comments both on SCE letterhead (Q1²⁷ and Q2²⁸ 2013) and in conjunction with other utilities via the Consortium for Energy Efficiency²⁹ (CEE) (Q1 2013). Many recommendations were incorporated, but a few leave opportunities for enhancement in the next revision process.

13.01.02 – Clothes Washers

The Draft 1 Version 7.0 specification for clothes washers³⁰ was released in late 2012. A revised draft specification and draft test method are expected in early Q3 2013. SCE will review and provide comments as needed.

13.01.03 – Climate Control

²⁶ Final Specification and Test Method for Refrigerators/Freezers [available at: https://www.energystar.gov/ia/partners/product_specs/program_reqs/Refrigerators_and_Freezers_Program_Requirements_V5.0.pdf?efdc-035c].

²⁷ Q1 2013 SCE Comments on refrigerator/freezer specifications [available at: <http://www.energystar.gov/products/specs/sites/products/files/Southern%20California%20Edison%20Comments.pdf>].

²⁸ Q2 2013 SCE Comments on refrigerator/freezer specifications [available at: <http://www.energystar.gov/products/specs/sites/products/files/SCE%20Comments%20-%20Energy%20Star%20Ref%20Frzr%20Final%20Draft%20V5%200.pdf>].

²⁹ Q1 2013 CEE Comments on refrigerator/freezer specifications [available at: http://www.energystar.gov/products/specs/sites/products/files/CEE%20Comments_3.pdf].

³⁰ Draft 1 Version 7.0 Specification for Clothes Washers [available at: https://www.energystar.gov/products/specs/sites/products/files/V7_D1_Specification_0.pdf].

The EPA initiated the communicating climate controls effort in 2010. The last activity was in May 2012, when the California IOUs commented on the Draft 3 specification.³¹ At this point, timing of further action by the EPA is unknown.

13.01.04 – Pool Pumps

The EPA released a Pool Pumps Connected Functionality Discussion Document³² in late 2012. Industry groups (EPRI/CEE) have begun member discussions to get their initial reaction and input on the best way to proceed. SCE participated in these discussions in Q1–Q2 2013. Two field studies currently under way (DR12.08.02: DR-Ready Pool Pumps for Residential Retrofit and DR12.08.01: ZigBee-Based DR Residential Pool Pumps) are lending significant real-world technical data to these discussions. The EPA is expected to release a formal draft specification in Q3 2013.

Next Steps

SCE will continue to monitor the progress of these (and potentially additional) ENERGY STAR activities to ensure that product specifications achieve the intended goal of placing energy-efficient products with DR capabilities into the hands of consumers. Comments will be provided as necessary to craft these specifications around products that are ready for immediate enrollment and participation in utility DR programs.

³¹ ENERGY STAR Program Requirements for Residential Climate Controls (Draft 3) [*available at:* http://www.energystar.gov/products/specs/sites/products/files/Residential_Climate_Controls_Draft_3_Version_1_Specification.pdf].

³² Pool Pumps Connected Functionality Discussion Document [*available at:* http://www.energystar.gov/products/specs/sites/products/files/ENERGY_STAR_Pool_Pumps_Connected_Functionality_Discussion_Document.pdf].

5. Budget

Emerging Markets and Technology Recorded Expense: 2012–2014 (\$)					
Expense Type	2012	2013 January-June	2014	2012–2014 Totals	2012–2014 Authorized Funding
Labor	913,668	392,056		1,305,724	
Non-Labor	733,581	181,536		915,117	
Total 2012–2014	1,647,249	573,591		2,220,840	7,303,969
2011 Carryover ³³	780,361	639,975		1,420,336	4,200,000
Total	2,427,610	1,420,336		3,641,177	11,503,969

33 Authorized in SCE's Advice 2685-E [available at:
<https://www.sce.com/NR/sc3/tm2/pdf/2685-E.pdf>].

6. SCE's Third Party Collaborative DR Stakeholders

- California Energy Commission (CEC)
- Demand Response Research Center (DRRC) at Lawrence Berkeley National Laboratory (LBNL)
- Emerging Technologies Coordinating Council (ETCC)
- California Lighting Technology Center (CLTC)
- Electric Power Research Institute (EPRI)
- Open Automated Demand Response (OpenADR) Alliance
- Consumer Electronics Association (CEA)
- U.S. Green Building Council (USGBC)
- Custom Electronic Design & Installation Association (CEDIA)
- West Coast Utility Lighting Team (WCULT)
- International Association of Lighting Designers (IALD)
- Illuminating Engineering Society of North America (IESNA)
- Sacramento Municipal Utility District (SMUD)
- University of California Berkeley's DR Enabling Technology Development Project