

September 30, 2014

Ed Randolph
Director, Energy Division
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Re: A.11-03-001 et al- Southern California Edison Company's 2014 Semi-Annual Report on Demand Response Emerging Technologies Program

Dear Mr. Randolph:

In accordance with Decision 12-04-045, Ordering Paragraph 59, attached please find Southern California Edison (SCE) Company's semi-annual report. This report is also being served on the most recent service list in Application 11-03-001 et al., and has been made available on SCE's website. The URL for the website is:

Go to www.sce.com;

- Click on the "Regulatory" Information link at the bottom of the page;
- Select "CPUC Open Proceedings";
- Enter "A.11-03-001" in the search box;
- Locate and select the "SCE Emerging Markets & Technology DR Projects 2014 Semi-Annual Report" link to access associated document.

If you have any questions, please feel free to contact me.

Very truly yours,

/s/ R. Olivia Samad

R. Olivia Samad

cc: A.11-03-001 et al. Service List

Enclosure



Emerging Markets & Technology Demand Response Projects Semi-Annual Report: Q1–Q2 2014

Submitted in Compliance with D.12-04-045
Decision Adopting Demand Response
Activities and Budgets for 2012 through 2014

Prepared by
Southern California Edison Company (U-338-E)

September 2014

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Acronyms

AC	air conditioning
ACEEE	American Council for an Energy-Efficient Economy
ADR	automated demand response (also seen as Auto-DR)
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AMI	advanced metering infrastructure
ARRA	American Recovery & Reinvestment Act
ASHRAE	American Society of Heating and Air-Conditioning Engineers
AT	Advanced Technology
BAN	building area network
BCD	Business Customer Division
BESS	battery energy storage system
BEMS	building energy 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&S	Codes and Standards
CS	Customer Service
CPUC	California Public Utilities Commission
D	Decision
DOE	Department of Energy
DR	demand response
DRAS	demand response automated server
DRMEC	Demand Response Measurement and Evaluation Committee
DRMS	demand response management system
DRPP	Demand Response Partnership Program
DRRC	Demand Response Research Center
DSM	Demand-Side Management
EDF	Environmental Defense Fund
EE	energy efficiency
EEC	Energy Education Center
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
IDSMM	Integrated Demand-Side Management
IESNA	Illuminating Engineering Society of North America
IOU	investor-owned utility
ISDG	Irvine Smart Grid Demonstration
kW	kilowatt
kWh	kilowatt-hour
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy and Environmental Design
MSO	Meter Services Organization
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
OP	Ordering Paragraph
OpenADR	Open Automated Demand Response
PCT	programmable communicating thermostat
PLMA	Peak Load Management Alliance
PLS	Permanent load shift
PTR	Peak Time Rebate
QI/QM	Quality Installation/Quality Maintenance
RESU	residential energy storage unit
RFI	Request for Information
SCE	Southern California Edison Company
SONGS	San Onofre Nuclear Generating Station
TES	thermal energy system
TOU	Time of Use
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. Background

The *Emerging Markets & Technology Demand Response (DR) Projects Semi-Annual Report: Q1–Q2 2014* is provided in compliance with Ordering Paragraph (OP) 59 of the California Public Utilities Commission (CPUC) Demand Response Decision (D.) 12-04-045,¹ dated April 30, 2012. The Decision directed Southern California Edison Company (SCE) to submit a semi-annual report regarding its DR Emerging Technology projects by March 31 and September 30 of each year.

Prior to D.12-04-045, the *Emerging Markets and Technology Report* was submitted annually consistent with OP 14 of CPUC Decision 09-08-027. In that decision, SCE was ordered to provide reports on the previous year’s Emerging Markets and Technology (EM&T) activities to the director of the Commission’s Energy Division, and provide copies to the most recent service list in this proceeding.

2. Summary

To help realize the benefits of DR—greater grid security and improved use of generating resources—the Emerging Markets & Technology (EM&T) program at SCE develops and delivers emerging, technology-driven DR initiatives, projects, and studies that facilitate customer acceptance of cost-effective DR and promote behavioral change. 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, which 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 2014 is submitted as directed in CPUC D.12-04-045, cited above.

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 investor-owned utilities (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.

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.]

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 (IDSMD) 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 Service (CS) organization.
- 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 plays 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.
- Publication of full reports on EM&T projects on the Emerging Technologies Coordinating Council (ETCC) website,² 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 Plan.³
- 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: <http://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>].

- Assistance in organizing the Peak Load Management Alliance (PLMA) spring and fall conferences, events intended to promote and support DR technologies, markets, and programs and services.

In the first half of 2014, SCE completed, continued, and started the EM&T projects listed in the table below.

Category	Project
Codes & Standards	<ul style="list-style-type: none"> • Research into the DR potential of consumer appliances and controls, leading to the development of DR-capable appliances and thermostats that are incorporated as 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 • Scoping study of standards and activities that affect California’s DR and permanent load shift (PLS) efforts
Testing	<ul style="list-style-type: none"> • Field testing of various end-use appliances and controls to understand their DR capabilities • PLS opportunities using batteries • Pilot project to test and evaluate small batteries as residential energy storage units • Establishment of DR capabilities in smart appliances • Testing to understand the DR potential of mass market DR-ready products and appliances • Evaluation of the DR potential of systems using advanced refrigerants
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"> • Examining of DR tactics in light of new regulations, emerging market needs, new technologies, and SCE’s strategic goals • 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 networked system 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.

3. Projects Completed Q1–Q2 2014

DR12.04 Title 24 OCST Compliance

Overview

In past funding cycles, 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 continued the code update by developing Reference Appendices,⁷ which provide guidance to the public on implementing the various code measures. The current project provided guidance and support to CEC in developing compliance manuals on OCST.

Collaboration

This project was undertaken in cooperation with SCE’s C&S Program and in close collaboration with CEC.

Status

This project began in late 2012, once CEC adopted the code language and SCE had retained the consultant who had assisted in developing the Codes and Standards Enhancement (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. SCE’s role as technical advisor/support to CEC ended with completion of the compliance manuals, finished by the CEC to allow for the 2013 Title 24 code update to go into effect in July 2014.

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: *Id*]

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

Overview

This project involved research into the next generation of home and building area network energy management and control systems for residential and small commercial customer applications. To this end, the project collected and incorporated research information on existing and documented installations with networked technologies from domestic and international research organizations, utilities, manufacturers, and distributors.

Collaboration

This project was executed in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

The research, which evaluated new and upcoming technologies from more than 50 technology providers, is complete. The project also identified a home area network/building area network (HAN/BAN) system for a future field evaluation (see DR12.19, Field Testing of Networked Systems for Fault Detection and Diagnostics) by determining utility EE and DR program requirements and assessing the potential for integrating such services as energy management, security, entertainment, and building automation. The team initiated the project in November 2012 and completed the bulk of the work in Q1–Q2 2013. The final project report was completed in Q1 2014.

DR12.26 Third-Party Programmable Communicating Thermostat Study

Overview

This field study evaluated the potential of leveraging the existing installed base of internet-based OCSTs (also known as programmable communicating thermostats) from third parties, including thermostat manufacturers and home security companies. Such technologies, which enable communication via the Internet (over broadband) with customers, may increase the ease of use of OCSTs and lower the cost of rapid load shedding by customers during hot summer periods. This is 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 automation server (DRAS) initiated the DR event, and used OpenADR to communicate over the Internet with the servers of participating third parties. The third parties then issued a signal to the OCST using their proprietary communication protocol.

SCE targeted third-party vendors whose customers were also SCE customers. These vendors entered into agreements with OCST-owning customers that authorized the vendor to pre-cool the home, and/or remotely adjust the OCST to reduce energy use during peak hours on Save Power Days. The agreements included other important provisions. For example, vendors were required to notify customers that they would be adjusting the OCST by 2:30 pm on the day before the Save Power Day, and customers were provided the ability to manually override the remote adjustment at any time.

Further, through these agreements, customers gave SCE permission to release their meter usage and billing data to the vendor. However, vendors were allowed to use this data only to develop proprietary algorithms that enabled more effective remote management of the OCSTs to achieve the ideal goal of enhancing peak demand management while cost-effectively cooling customer homes, without compromising customer comfort.

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

Collaboration

SCE partnered with several third parties and leveraged their existing customers and installations in the field. The diverse mix of partners ranged from a manufacturer of OCSTs to a cloud service provider targeting OCST installers to software developers using the pilot to gain experience in this sector. Contract development focused on creating a generic contract to allow for scaling to serve the needs of any future programs around this concept, as well as the implementation of a standard communication protocol in OpenADR 2.0.

Status

The project was initiated in Q3–Q4 of 2012. By July 2013, the three vendors had collectively signed up just over 2,800 residential customers, reaching about 94% of the project’s target. Over the

summer of 2013, SCE called five Save Power Days events using these third-party partners, and each of these events resulted in energy shedding. Successful completion of the testing required the development of processes for initiating DR events, recruiting and ensuring the eligibility of customers to participate, providing incentives in the form of bill credits to customers who reduced load, and the payment of a management fee to participating vendors.

This project is now complete. The third-party vendors reported their findings to SCE at the end of 2013. After reviewing results, SCE prepared a formal evaluation report and presented it to the Demand Response Measurement and Evaluation Committee (DRMEC) in Q2 2014.

SCE will conduct a follow-on study in 2014, with slight deviations from the 2013 study. Details and results from the follow-on study will be provided in the Q3–Q4 2014 Semi-Annual Report.

DR13.02 Demand Response and Permanent Load Shift: A Scoping Study to Review Standards and Activities that Impact California

Overview

Increasing California DR and PLS capabilities requires an understanding of the international, federal, and state organizations that play roles in defining policies, regulations, and mandates for DR and PLS both inside and outside of California. To this end, this scoping study explored the policies, plans, initiatives, programs, and mandates of stakeholder organizations and analyzed their potential impacts on California's DR, EE, and Codes and Standards programs. The conclusions and recommendations being developed by this study are intended to provide guidance for SCE to pursue future DR, EE, and C&S activities.

Collaboration

This project is a collaborative effort with SCE's Codes and Standards group.

Status

The project is now complete. Findings and recommendations from this study are providing valuable input to SCE as it advances a range of energy activities.

4. Projects Continued Q1–Q2 2014

DR09.02 Home Battery Pilot at Irvine Smart Grid Demonstration

Overview

This project, which began in 2009, is evaluating and testing 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 impacts, 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. Following receipt of UL certification early in 2013, the team installed several RESU units as part of the Irvine Smart Grid Demonstration project in June 2013 and conducted several tests to determine the effectiveness of these units over the summer of 2013 using the different modes available in the RESU. Testing continued during 2014 with additional operating modes tested or planned for testing prior to the end of the year.

Next Steps

Testing at ISGD and at other sites will continue throughout 2014. A final report, slated for submission at the end of 2014, will provide information on the feasibility of using these types of batteries as a DR resource, as well as any additional project findings. Participating customers will be changed to a Time of Use (TOU) rate prior to testing some operating modes in order to better demonstrate potential benefits of a RESU with dynamic pricing.

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 ways to capitalize on the Edison SmartConnect™ metering and HAN deployment to further enable residential DR in coordination with EE and distributed energy resources. To advance 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 is demonstrating 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, Project DR09.08 focuses on demonstrating 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 a RESU block. All the homes received communicating thermostats, energy information displays, and smart appliances. The project will conduct a variety of DR experiments to evaluate the use of SCE’s 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 AT organization. It also collaborates with DOE in support of their larger Smart Grid demonstration efforts.

Status

Monitoring continues on the HAN devices installed as part of the early field test. 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. The project installed all HAN devices during June of 2013 and successfully completed an initial test. In addition, the team completed several tests during 2013, including a December test to determine any heating loads available during winter months. Testing continued during 2014 with test events in February and June to evaluate additional DR strategies with thermostats and appliances. Additional analysis of collected data has also been completed in an attempt to better identify usage patterns of the devices in each home.

Next Steps

The project team will conduct planned experiments and monitor results throughout the year and generate a final report by the end of 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. Conducted in a controlled environment, these tests 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 and DOE’s Physical Characterization of Grid-Connected Commercial and Residential Buildings End-Use Equipment and Appliances effort). 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 2013 and Prior Years			
Refrigerator/Freezer	10.16.RF-A	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 2014			
Refrigerator/Freezer			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 TTC laboratory facilities and staff.

Status

As the table above shows, TTC has completed testing and has prepared technical reports for two refrigerators (manufacturers A & B), two clothes washers (manufacturers A & B), and one dishwasher (manufacturer A). Results were or will be shared in several public forums, including the American Council for an Energy-Efficient Economy (ACEEE) Summer Study¹² for the years 2012 and 2014 and the 2013 American Society of Heating and Air-Conditioning Engineers (ASHRAE) Annual Conference.¹³

Next Steps

The team started testing an additional refrigerator (10.16.RF-C) in Q2 and will begin testing a clothes washer (10.16.CW-C) received from the third manufacturer in Q3 2014. To provide a comprehensive

¹² Energy-Efficiency Economy (ACEEE) Summer Study [*more information available at: <http://aceee.org/conferences/2012/ssb> and <http://aceee.org/conferences/2014/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>].*

analysis, the team is expected to prepare a final report compiling all test data collected after completion of all appliance testing by end of 2014.

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

Overview

Electrical energy storage–based devices, such as batteries, are still being explored as emerging technologies for their ability to provide permanent load shift and DR resources, including short-term ancillary services and local voltage regulation support for distributed generation. This project will find a commercial site for field testing an advanced battery-based PLS system that will supply all or part of the site’s load and be equipped with advanced controls to allow the implementation and evaluation of various advanced DR scenarios.

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

Collaboration

This project is being executed by SCE’s DSM Engineering group, with support from the EVTC organization.

Status

SCE has completed fabrication of the battery energy storage system (BESS) and identified a field test site. CE’s general contractor is preparing a site for BESS, including setting up all electrical (power transfer switches, conduits), mechanical (concrete pad), and communications (Internet) connections.

Next Steps

Next steps include a site acceptance test and system commissioning. This work will be followed by data collection and analysis, as well as reporting. This multi-year project is on track for completion by the end of 2014, and the report will be completed in Q1 2015.

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 goal is to pave the way for future industry-supported advanced DR lighting design certification programs.

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 phase 1 documents findings to develop and deliver a focused training curriculum, classes, and tests for lighting professionals.

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
- Consolidated Edison of New York
- Northwest Energy Efficiency Alliance
- National Grid
- NSTAR
- Sempra Energy
- Pacific Gas and Electric Company
- Southern California Edison Emerging Technologies group
- Southern California Edison Codes and Standards group

Status

The Curriculum Team has developed curriculum guidelines for a class on quality lighting, efficiency, and controls and integrated the 2013 Title 24 and Title 20 Code requirements released in June 2014 into the curriculum criteria. These additions, which support “California Quality” specifications for building certifications and acceptance testing and represent key learning objectives for lighting designers and architects, have been vetted with city and county planning departments.

Next Steps

The California Lighting Technology Center will be incorporating 2013 and 2016 Title 24 codes and standards curriculum requirements to align the Certification Program with existing state certification and acceptance training programs. Project completion is estimated for the end of Q4 2014.

DR12.07 Demand Response Partnership Program

Overview

As a result of efforts by the IOUs and Lawrence Berkeley National Laboratory (LBNL), automated demand response (ADR) 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 the point is adopted.

It is estimated that 58% of the some 1,400 LEED-certified buildings in SCE's service territory, representing 18 million ft², 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 the Demand Response Partnership Program (DRPP) is to show that establishing this LEED DR credit will decrease energy use, help stimulate expanded development of DR technologies, and be seen as a benefit by the building owner.

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 calls, webinars, and USGBC meetings; researching the effects of the credit's availability on market adoption and grid reliability; and researching the environmental impact of the point. In addition, EM&T staff will work with SCE's account managers, New Construction Services, and Regulatory Special Projects to achieve this project's objectives.

Status

USGBC requested further account base data analytics in defining DR potential and readiness to participate in other DR programs. The study continues to advance the USGBC position in support of utility energy efficiency and demand response programs at a national level with White House recognition.

Next Steps

USGBC is adding the account base data analytics to the report and will submit a final report to SCE for approval by the end of Q3 2014.

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,¹⁷ and the production-ready device is at the SCE HAN lab for final testing. SCE filed, and received approval for, Advice Letter 2685-E,¹⁸ requesting a continuation of the project into the 2012–2014 funding cycle. Testing in the field was completed during Q1 of 2014. Based on the final report showing inconsistencies with the communications to signal DR events and the fairly low DR potential with variable-speed pool pumps, SCE does not plan to pursue this type of solution at this time.

DR12.08.02 DR-Ready Pool Pumps for Residential Retrofit

The project identified retrofit solutions compatible with any existing pool pump in early 2012. Ongoing field testing of these solutions at customer locations was to be completed in Q2 2014. However, technical issues with the field installation of controller and other equipment have delayed the testing, which is now scheduled for Q3 2014. The results from this project will be used to inform the DR12.28 DR Pool Pump Study project underway. In addition, the test sites deployed for this project will become two additional sites for DR12.28.

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

¹⁵ Pool Pump Demand Response Potential [available at: <http://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].

¹⁷ <http://www.zigbee.org/Products/ByStandard/ZigBeeSmartEnergy.aspx>

¹⁸ Request to Continue Activities and Funding for Emerging Markets and Technology Projects [available at: <https://www.sce.com/NR/sc3/tm2/pdf/2685-E.pdf>].

Next Steps

The DR Pool Pump Study will continue through 2014 with final results documented in an end-of-year 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. These capabilities provide products that can be controlled by a smart thermostat and that offer such attributes as high energy efficiency, flexible operation, ease of installation, low noise, zone control, and comfort using all-electric technology.

Several strategies can be used to make variable refrigerant flow (VRF) systems DR-ready. For example, 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 spaces with air conditioning [AC]). In addition, 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. The project team 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 executed in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

The field test is progressing, and the equipment has been installed and commissioned. The project team is coordinating with the manufacturer to implement various hardware and software updates to enable possible DR activities.

Next Steps

Field tests are planned for the summer months of 2014. SCE will analyze the results and complete a final report in Q4 2014.

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

Overview

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

Collaboration

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

Status

The project team began planning during Q4 2012, and commenced the study in January 2013. Equipment construction is complete, and EPRI has implemented monitoring equipment in the field. The commissioning phase is in process.

Next Steps

SCE plans to install the equipment and engage the manufacturer with equipment hardware prior to summer 2014. After field tests, planned for the summer months of 2014, SCE will analyze the results and complete a final report in Q4 2014.

DR12.19 Field Testing of Networked 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) to conduct laboratory and field evaluations of currently available HAN/BAN systems. This activity will assess the systems' effectiveness in implementing utility DR programs, as well as evaluate their ability to collect, display, and communicate system fault detection and diagnostics (FDD) information when linked with residential and light commercial HVAC systems. In addition, the project team will explore network system control and automation functionality to determine the potential for automatic response to FDD signals as a means to optimize HVAC system performance.

Collaboration

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

Status

Through market research, the project team identified two HVAC systems that offer advanced FDD functionality and communications with HAN/BAN systems as candidates for laboratory and field assessment. Both HVAC systems are new to the market, and results from market research and discussions with the FDD system manufacturers suggested that additional technology development would be needed to effectively communicate FDD signals to networked systems and to service providers via cloud-based communication technologies. The team completed a proof-of-concept laboratory test in Q4 2013 to evaluate two advanced FDD systems. The test involved a residential AC system communicating FDD information to local and remote cloud-based communications systems available on smart phone and PC platforms. Field assessment of the performance of the two FDD technologies is currently underway at four sites in SCE's service territory.

Next Steps

The field assessment of two FDD technologies will be complete in early Q4 2014. The project is expected to be completed by the end of Q4 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. This project seeks to advance and support participation in the statewide PLS Program by creating, calibrating, and validating a pre-feasibility tool using the latest advanced building energy simulation engine. In this tool, thermal energy storage (TES) models will be defined for chilled water systems, ice tanks, and packaged ice storage. This project will also develop training to support the operation of the pre-feasibility tool, as well as an energy storage technology report.

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

Technical criteria for the different TES models are being wrapped up. A trial version of the software/tool is expected to be available by November 2014.

Next Steps

Once the trial version of this tool is completed, a technical review team (including implementers of the PLS Program) will test drive the tool and provide direct feedback on their progress to the development team. This multi-year project is scheduled for completion by the end of 2014.

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

Overview

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

Collaboration

This project is co-funded by SCE's Emerging Technologies Program as part of an EE/DR 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 networks that can provide HVAC fault detection and diagnostics

Status

The project team has deployed a DR-ready technology to seven residential sites. This device provides each site with a real-time energy usage profile and control opportunities for their window AC units. Field verification was conducted for equipment compatibility and device connectivity. The customers have established accounts through the technology's cloud-based system, which provides remote visibility. The system is accessible to the user through Zigbee, WiFi or smart phone applications.

Next Steps

The technology host and EPRI will be simulating DR events through their device platform. Multiple event tests will be conducted through October 2014. EPRI will develop a report that will discuss the field results, the DR capability of the technology, and current market availability. The project completion date is Q4 2014.

DR12.25 Ancillary Services Pumping Equipment

Overview

This project¹⁹ aims to evaluate the potential for customers with water pumping equipment to participate in an Ancillary Services DR program. The project team began planning in 2010 and conducted initial 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 limit (in megawatts {MW}) 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 (EEC)-Tulare, Field Engineering, and the Meter Services Organization (MSO).

Status

The project team has identified vendors that provide field communication systems and evaluated the capabilities of each potential solution. The team has also selected a vendor for the project, as well as selected and visited a field test site. In addition, a customer agreement has been reviewed and signed, and the communications antenna and control system has been installed at the EEC in Tulare. The team discovered that the antenna installed at EEC-Tulare is mounted too low to communicate with pumps at the field test site. An antenna repeater site has been identified, and SCE is in negotiations with the owner for permission to install the necessary equipment.

Next Steps

This project will continue to be implemented in phases. Six units are undergoing safety testing at SCE's MSO labs in Westminster. Once this testing is complete, SCE will evaluate different communication methods and increasing levels of integration with SCE's DR open source capabilities and future programs (Ancillary Services). The project is planned for completion by the end of 2014.

¹⁹ Reported as DR11.01 in SCE's Semi-Annual Q3-4 2012 EM&T Report.

DR12.28 DR Pool Pump Study

Overview

This project will leverage past research projects 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. The study will utilize networked pool pump controllers that can initiate DR events using either SCE's Advanced Metering Infrastructure (AMI) network and SmartConnect meters or the customer's Internet connection 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 2014.²⁰ After receiving approval for the study in April 2013,²¹ SCE launched the project. System and equipment limitations, including the need to customize equipment, created delays in the development and procurement of equipment and pushed the test phase of this project into Q1 of 2014. Additional issues with field installations further delayed testing, which is now scheduled for Q3 of 2014.

Next Steps

Customer enrollment is underway, and the issues at field test sites have been resolved. The remaining steps—installation of control equipment, conducting test events, and analyzing results—will be completed by the end of 2014. Successful findings from this study may lead to the creation of a DR program for pool pumps.

²⁰ CPUC proceeding A.12-12-017.

²¹ D.13-04-017. [available at:

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

DR12.30 Smart Energy Profile Ancillary Services Gateway

Overview

This project aims to demonstrate use of a broadband/ZigBee gateway capable of meeting California Independent System Operator (CAISO) requirements for DR bidding of sub-200-kW commercial and industrial DR loads into ancillary service markets. The project calls for lab testing and demonstration of a new architecture that utilizes a smart meter, a ZigBee-to-OpenADR 2.0b gateway, and a demand response management system (DRMS). The gateway will poll the SmartConnect meter for real-time consumption (in kilowatt-hours [kWh]) information in 15-second intervals and send the information through a broadband router to AutoGrid's DRMS. To confirm accuracy of the data, consumption (kWh) data in the meter will be compared to kWh data sent over the Internet to the DRAS.

Collaboration

This project is being conducted in collaboration with SCE's AT Distribution Automation & Communications and the MSO groups, leveraging their expertise with SmartConnect meters, distribution communications, and OpenADR 2.0 testing.

Status

The project team identified and commissioned AutoGrid's DRMS and Universal Devices ISY994i gateway for testing.

Next Step

The team's next step is to complete execution of test cases for the lab demonstration. The team will also validate the accuracy of consumption (kWh) telemetered data at 15-second intervals coming from the DRAS with profile load (kWh) data coming from the smart meter. Test results and implications will be summarized in a final report. The project is scheduled to be completed by Q4 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. The control capabilities of these occupancy-based control products could be used for DR. However, implementing this capability requires additional investment in software and communications, and 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

Since project start in Q1 2013, the team has identified customer sites, obtained signed agreements from customers, and installed the guest room controls. Further, the setup of vendors in the DR servers is complete. As of this date, one of the two vendors has obtained certification for ADR 2.0a, and the second vendor is in the certification process. Due to the sensitivity of accessing clientele information, additional time has been needed to initiate the process in the various hotel establishments, which in turn has delayed the initial timeframe.

Next Steps

SCE plans to install power monitoring equipment and initiate accounts on the SCE ADR 2.0 test server. Project completion is anticipated in Q3 2014.

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

Overview

This project covers SCE involvement in the EPA’s specification development for “Connected” ENERGY STAR products. ENERGY STAR typically recognizes products with top in-class energy performance by allowing display of the ENERGY STAR logo on such products and use of the logo in advertising campaigns. Manufacturers voluntarily participate by investing the resources required to design equipment that is more efficient than that of their competitors. This program is well known in the United States and 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 DR 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 methods²² often are incorporated in whole or in part into mandatory performance standards adopted by DOE or state agencies, such as 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 mandatory 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

²² 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_value2%5Bvalue%5D%5Bdate%5D=&=Apply].

- Comment on the DR verification test methods based on prior lab experience, as well as alignment with eventual DR program deployments

This project is divided into six sub-projects; each addresses 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
Clothes Dryers	13.01.05
Dishwashers	13.01.06

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/freezers²³ was published in May 2013. SCE provided several sets of written comments both on SCE letterhead (Q1²⁴ and Q2²⁵ 2013) and in conjunction with other utilities via the Consortium for Energy Efficiency (CEE)²⁶ (Q1 2013). Many recommendations were incorporated, but some recommendations presented opportunities for enhancement in the next revision process.

²³ ENERGY STAR® Program Requirements Product Specification for Residential Refrigerators and Freezers; Eligibility Criteria Version 5.0 [available at: https://www.energystar.gov/ia/partners/product_specs/program_reqs/Refrigerators_and_Freezers_Program_Requirements_V5.0.pdf?efdc-035c].

²⁴ Q1 2013 SCE Comments on refrigerator/freezer specifications [available at: http://www.energystar.gov/products/spec/residential_refrigerators_and_freezers_specification_version_5_0_pd].

²⁵ Q2 2013 SCE Comments on refrigerator/freezer specifications [available at: *Id.*].

²⁶ Q1 2013 CEE Comments on refrigerator/freezer specifications [available at: *Id.*].

13.01.02 – Clothes Washers

EPA released a final draft version of the product specification for clothes washers in December 2013. SCE provided comments in conjunction with other interested parties through CEE²⁷ (Q1 2014). A final version was published in Q1 2014.²⁸

13.01.03 – Climate Control

The EPA initiated the communicating climate controls effort in 2010. After a lull in project activity since May 2012, EPA developed a new approach and released a memo²⁹ at the end of Q2 2014. SCE did not provide comments on this memo but has recently been involved in discussions between the industry groups EPRI and Air-Conditioning, Heating, and Refrigeration Institute (AHRI) to work out some of the technical needs and desires for DR-capable climate control equipment.

13.01.04 – Pool Pumps

The EPA released a draft 1 document for “Connected” pool pump criteria³⁰ in Q1 2014. SCE worked with several other utilities and key players to provide comments to EPRI and CEE. EPA summarized all stakeholder comments into a single comment and response document.³¹ Two SCE field studies currently under way (DR12.08.01 ZigBee-Based DR Residential Pool Pumps and DR12.08.02: DR-Ready Pool Pumps for Residential Retrofit) are lending significant real-world technical data to these discussions. The EPA is expected to finalize the specification in 2014.

²⁷ Q1 2014 CEE Comments on clothes washer specifications [*available at* <http://www.energystar.gov/sites/default/files/specs//CEE%20Comments%20ENERGY%20STAR%20Clothes%20Washer%20Final%20Draft%20Version%207.pdf>]

²⁸ ENERGY STAR® Program Requirements Product Specification for Clothes Washers; Eligibility Criteria Version 7.0 [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Final%20Version%207.0%20Clothes%20Washer%20Program%20Requirements.pdf>]

²⁹ Climate Controls Memo [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Climate%20Controls%20Memo.pdf>]

³⁰ Pool Pump Connected Functionality – Draft 1 Criteria [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Pool%20Pump%20Draft%201%20Connected%20Criteria%201-14-2014.pdf>]

³¹ Draft 1 Comment Summary and EPA Response [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Pool%20Pump%20Draft%201%20Connected%20Criteria%201-14-2014.pdf>]

13.01.05 – Clothes Dryers

EPA released a clothes dryer supplemental proposal³² in December 2013 focused on EE issues that did not address DR “Connected” criteria. EPA released final version 1.0 product specification³³ in May 2014, which included “Connected” criteria.

13.01.06 – Dishwashers

EPA released a dishwasher draft 1 version 6.0 product specification³⁴ in Q1 2014. The new specification addressed two major areas: inclusion of a cleaning performance test to ensure efficiency doesn’t affect cleaning ability and inclusion of “Connected” criteria. SCE contributed to a comment letter submitted by CEE.³⁵

In Q2 2014 EPA released a draft 2 version 6.0 a dishwasher product specification.³⁶ SCE plans to provide comments through a CEE comment letter to be submitted in Q3.

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. SCE will provide comments as necessary to craft these specifications around products that are ready for immediate enrollment and participation in utility DR programs.

³² Clothes dryer supplemental proposal [*available at*: <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Clothes%20Dryers%20Supplemental%20Proposal.pdf>]

³³ ENERGY STAR® Program Requirements Product Specification for Clothes Dryers Eligibility Criteria Version 1.0 [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Final%20Version%201%200%20Clothes%20Dryers%20Program%20Requirements.pdf>]

³⁴ ENERGY STAR® Program Requirements Product Specification for Residential Dishwashers Eligibility Criteria Draft 1 Version 6.0 [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Draft%201%20Version%206%200%20Residential%20Dishwasher%20Specification.pdf>]

³⁵ Q1 2014 CEE Comment Letter [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Residential%20Dishwashers%20Draft%201%20Version%206%20-%20CEE%20Comments.pdf>]

³⁶ ENERGY STAR® Program Requirements Product Specification for Residential Dishwashers Eligibility Criteria Draft 2 Version 6.0 [*available at* <http://www.energystar.gov/sites/default/files/specs//ENERGY%20STAR%20Draft%202%20Version%206.0%20Residential%20Dishwasher%20Specification.pdf>]

5. Projects Initiated Q1–Q2 2014

DR13.06 EPRI EB III A - Variable Capacity Space Conditioning Systems for Residential

Overview

The purpose of this project is to evaluate the DR capability of VCHP systems. The three products to be tested will be traditional “American-style” high static ducted systems from three to five manufacturers. The project team will leverage lab and field testing to evaluate the response of the VCHP system to demand control signals. An appropriate signaling/controlling method will be selected (such as OpenADR 2.0) to enable DR testing under varying operating conditions.

Project plans call for first conducting a survey of available technologies, and then developing and executing lab and field test plans. Steps for the field tests include generating and applying site selection criteria, creating site monitoring plans, and installing, commissioning, and testing the systems. Deliverables from the project will include documentation of the various steps, test plans and results, and a final report.

Collaboration

The program manager for the Summer Discount Program will be continually engaged to ensure the results of this project are in line with program needs. Further, the project team will collaborate with the program manager and a certified contractor in the Residential HVAC Quality Installation/Quality Maintenance (QI/QM) Program to ensure HVAC technologies are installed and maintained properly.

Status

EPRI submitted documents for deliverables for Task 1 (Survey Available Technologies) and 2.1 (Select Equipment for Lab Evaluation). The team is identifying a Residential HVAC QI/QM Certified Contractor for field test effort, identifying potential field sites, and installing and maintaining HVAC equipment. SCE EM&T is soliciting feedback from SCE program managers to provide comments on the deliverables to EPRI.

Next Steps

EPRI, the certified HVAC contractor, and SCE will consult on the field testing, which is projected to begin Q2 2015. The project is slated for completion in Q4 2015.

DR13.07 EPRI EB III B – HVAC & Refrigeration Systems Using Advanced Refrigerants

Overview

In response to the continuing phase-out of halogen-based refrigerants, the industry is seriously examining ultimate replacements, focusing on ammonia and hydrocarbon refrigerants. Ammonia is receiving particular attention, thanks to its exceptional thermodynamic characteristics, and ammonia systems are being developed for conventional applications. Such systems may increase efficiency over halogenated refrigerants, and the industry is working to mitigate the disadvantages of ammonia and hydrocarbon refrigerants—namely toxicity and flammability—by developing new configurations using small refrigerant charges in sealed systems and secondary hydronic loops.

Further, advanced product development engineering is creating ever-more flexibility. For example, ammonia can now be used in smaller refrigeration systems, primarily due to use of capacity variation and integrated controls. This engineering approach may allow these new systems to serve as tools for energy efficiency, DR, intermittent generation integration, and other utility load management strategies.

This project will explore and document advances in product development for advanced refrigerants in applications fueled by natural gas and electricity, with the goal of identifying products for laboratory evaluation and field deployment. Once appropriate systems are selected and laboratory tested, this project intends to field test systems using advanced refrigerants in commercial and small industrial applications at multiple sites in SCE's service area to evaluate their effectiveness for energy efficiency and demand response.

Collaboration

This project was initiated by the Customer Service NPDL group and is being executed by EPRI with project management from SCE's TTC.

Status

The project team has made significant progress on Task 1, the survey of available technologies, and has identified several promising technologies for laboratory and field demonstrations.

Next Steps

The project team will continue exploring technologies for laboratory and field demonstrations and begin zeroing in on the actual technologies to be tested in both gas and electricity applications. In addition, SCE will start the search for customer sites for field testing. The project is slated for completion in Q4 2015.

DR13.07 EPRI EB III D – Advanced Energy Efficiency and Demand Response Concepts in Data Centers

Overview

The goal of this project is to conduct field test to evaluate three measures that could provide energy efficiency and demand response capabilities in the data center environment:

- A software program that reduces computer power demand in response to an OpenADR signal
- Liquid cooling technology for data center servers
- Replacement of existing computer servers with more efficient equipment

The evaluations will cover the performance, customer acceptance, operational viability, efficiency and demand savings, and cost-effectiveness of the technologies. Steps in the project will involve identifying specific technologies to be evaluated, developing test plans, locating field sites for testing, conducting tests, and reporting results.

Collaboration

The work will be done in collaboration with EPRI, which conducts research on issues related to the electric power industry.

Status

To date, the project team has identified several technologies for evaluation:

- Sub-Project A – A software program
- Sub-Project B – A liquid cooling system for rack-mounted computers
- Sub-Project C – Blade servers for micro computers

Next Steps

The project team is now focused on finding field test sites and developing test plans. This project will continue through Q3 2015, with the final report slated for completion in Q4 2015.

DR13.09 EPRI EB III E – DR-Ready Consumer Products

Overview

This project seeks to build understanding of the potential for—and possible barriers to—DR from mass market (residential and small commercial) DR-ready devices. By analyzing test data and conducting lab evaluations of devices that have not yet been tested, the project will determine the mass market end-use devices with highest DR technical potential in SCE’s service area. Testing will also demonstrate device response by signal type and method, as well as determine what verifying data is sent by each device to the utility. In particular, testing will help identify gaps between program requirements and device response (if any). Devices to be tested may include central HVAC, pool and agricultural pumps, window air conditioners, plug load controls, and appliances.

The project will also identify the functional specifications needed to enable the devices to deliver the desired DR. These specifications, which are intended to serve as the basis for standards development, may be aligned with current and future DR needs for SCE, the use of automated-DR technology (such as OpenADR), and Title 24 and national requirements. Plans call for transferring evaluation results to manufacturers and standards organizations for standards and product development.

Collaboration

This project was initiated by the Customer Service NPDL group and is being executed by EPRI with project management from SCE’s TTC.

Status

The project team has made significant progress on Task 1, analyzing the DR potential of mass market devices in SCE’s service area. A prototype calculation tool was developed and is currently being revised to capture necessary information and provide a more useful end product.

Next Steps

The team will finalize the calculation tool and use it to analyze the DR potential of various residential devices, applying the best available residential usage profiles. Once this analysis is complete, the team will develop a laboratory testing plan to address the gaps in existing DR intelligence. The project is slated for completion in Q4 2015.

6. Budget

Emerging Markets and Technology Recorded Expenses: 2012–2014 (\$)					
Expense Type	2012	2013	2014 (June YTD)	2012–2014 Totals	2012–2014 Authorized Funding
Labor	622,051	788,53	374,070	1,784,658	
Non-Labor	675,631	1,493,971	1,029,531	3,199,133	
Total 2012–2014 Funding Cycle	1,297,682	2,282,508	1,403,601	4,983,791	8,278,969
Labor	361,391	4,552	4,646	370,589	
Non-Labor	768,537	2,014,572	150,508	2,933,617	
Total 2009-11 Carryover ³⁷	1,129,927	2,019,124	155,154	3,304,206	4,230,000
Grand Total	2,427,610	4,301,632	1,558,755	8,287,977	12,508,969

³⁷ Authorized in SCE's Advice 2685-E [available at: <https://www.sce.com/NR/sc3/tm2/pdf/2685-E.pdf>].

7. SCE's Third-Party Collaborative DR Stakeholders

- American Council for an Energy-Efficient Economy (ACEEE)
- Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
- California Energy Commission (CEC)
- California Lighting Technology Center (CLTC)
- California Public Utilities Commission (CPUC)
- Consolidated Edison of New York
- Consortium for Energy Efficiency (CEE)
- Consumer Electronics Association (CEA)
- Custom Electronic Design & Installation Association (CEDIA)
- Demand Response Research Center (DRRC) at Lawrence Berkeley National Laboratory (LBNL)
- Electric Power Research Institute (EPRI)
- Emerging Technologies Coordinating Council (ETCC)
- Environmental Defense Fund (EDF)
- Illuminating Engineering Society of North America (IESNA)
- International Association of Lighting Designers (IALD)
- National Grid
- New York State Energy Research and Development Authority (NYSERDA)
- Northwest Energy Efficiency Alliance (NEEA)
- NSTAR
- Open Automated Demand Response (OpenADR) Alliance
- Pacific Gas & Electric (PG&E)
- Peak Load Management Alliance (PLMA)
- Sacramento Municipal Utility District (SMUD)
- San Diego Gas & Electric (SDG&E)
- Sempra Energy
- U.S. Green Building Council (USGBC)
- University of California Berkeley's DR Enabling Technology Development Project
- West Coast Lighting Consortium
- West Coast Utility Lighting Team (WCULT)