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Emerging Markets & Technology Demand Response (DR) Projects Semi-Annual Report: Q3–Q4 2013

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

Prepared by
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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)
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
BEES	battery energy storage system
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
EEC	Energy Education Center
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
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
Open ADR	Open Automated Demand Response
PCT	programmable communicating thermostat
PLS	Permanent load shift
PTR	Peak Time Rebate
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. Background

This Semi-Annual Emerging Markets and Technology Demand Response Report is provided in compliance with Ordering Paragraph (OP) 59 of the California Public Utilities Commission (CPUC) Demand Response (DR) Decision (D.) 12-04-045, dated April 30, 2012. The Decision directed Southern California Edison Company (SCE) to submit a semi-annual report regarding its 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 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 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, which draws on research into customer preferences and the market potential for DR.

This report on SCE's DR activities program over the third and fourth 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

[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.

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.
- 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.
- 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*: 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 second half of 2013, SCE completed, continued, and started the EM&T projects listed in the table below.

Category	Project
Codes & Standards	• 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
Testing	• 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	• Projects targeting the ancillary services market, which require quick-response DR resources
Education	• Education of selected professionals (lighting experts and pool pump industry) about the benefits of DR-ready products
Special Projects	• 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 Q3–Q4 2013

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 communications protocol that will connect smart energy devices in a home to the Smart Grid—will enable implementation of advanced metering infrastructure (AMI) over a significant new pathway: broadband. This project was designed to enhance understanding of broadband's potential for delivering demand response (DR) signals by conducting the following tasks:

- Investigate the broadband communication path for DR
- Identify, test, and evaluate SEP 2.0 gateways that can bridge smart meters and the Internet to SEP 2.0 devices
- Identify and test SEP 2.0 home area network (HAN) devices for DR

Collaboration

This project was executed in cooperation with SCE's Advanced Technology (AT) organization.

Status

The project team collaborated with vendors and smart grid engineers to procure and develop SEP 2.0 test tools, test cases, and laboratory test procedures. Because an SEP 2.0–compatible PCT was not available for testing, the team retained a vendor to design and develop an SEP 2.0–compatible Android application. The team demonstrated SEP 2.0 communications over broadband using an Android tablet in two lab events, occurring in Q3 and Q4 of 2013. SCE recently cancelled this project following a redirection in corporate objectives and market trends.

Next Steps

The Smart Charging Pilot[4] team will incorporate the SEP 2.0 gateway into their pilot, and will demonstrate DR over broadband using SEP 2.0–compatible electric vehicle supply equipment.

[4] https://www.sce.com/NR/sc3/tm2/pdf/2749-E.pdf

DR12.13 AutoDR Programmable Communicating Thermostat: Phase 2

Overview

This project demonstrated the capability of an occupant-controlled smart thermostat (OCST) using automated DR (Auto-DR or ADR) 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 commercial and industrial (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. This project is a follow-up to a 2012 project, Auto-DR OCST using OpenADR 1.0.[5]

As part of the project, SCE's existing Demand Response Automated Server (DRAS) initiated DR events using OpenADR to send signals to the OCSTs over the internet to provide load drop.

Status

The project is complete, and the final report will be completed in Q1 2014.

Next Steps

No further steps will be taken for this project. However, findings will be used to guide future OCST work and program offering design.

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

DR12.27 Pool Pump DR Education

Overview

This project leveraged existing energy efficiency (EE) efforts to educate members of the pool and spa industry about the benefits of running pool pumps primarily during off-peak times to help alleviate potential peak-time grid constraints, especially on hot summer afternoons. Specifically, this project was designed 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 was conducted in collaboration with SCE's EE group.

Status

The planning for this project began during the second half of 2012, and it was 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.[6] After receiving approval in April 2013,[7] SCE launched the project in August 2013. Originally, the program was intended to target installers participating in the EE variable speed pool pump program by offering an additional incentive for scheduling pool pumps to run off peak. Because the new EE program did not launch as anticipated, the study focused on previous, rather than new, installations. In light of lower-than-anticipated participation and a new provision regarding off-peak scheduling of pool pumps in SCE's 2014 EE program, SCE has decided to cancel further activity in the pool pump DR education study.

Next Steps

Because provision of rebates within the new EE program will be contingent on scheduling pool pumps to run off-peak, no further efforts will be taken under this project.

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[6] CPUC proceeding A.12-12-017.

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

DR12.29 KYZ Ancillary Services Gateway

Overview

This project, which was initiated in late 2012, was intended to demonstrate a low-cost telemetry solution that will provide energy usage for future ancillary services (quick-response/short-duration) programs. This solution 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

Based upon SCE's ability to conduct lab testing of gateway devices instead of KYZ, SCE determined that DR12.29 should be cancelled in order to avoid expending resources on duplicative projects. DR12.30 (Smart Energy Profile Ancillary Services Gateway) is testing the same concepts using gateway devices that will be able to provide data on functionality and interoperability that would have met the goals of DR12.29

Next Steps

No further action is planned for this project.

4. Projects Continued Q3–Q4 2013

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 K[8] 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-E[9] 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 (ISGD) 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.

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. The testing conducted outside of the ISGD project will be reported under a different project number in the future.

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[8] 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], pp. 449–455].

[9] 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 HAN deployment to further enable residential DR in coordination with EE and distributed energy resources. To advance this goal, the Emerging Markets and Technology (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)[10] 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 an RESU block. All the homes will receive 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.

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.

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[10] 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 under way (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 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 Technology Test Centers (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 of these completed tests have been or will be shared in several public forums, including the American Council for an Energy-Efficient Economy (ACEEE) Summer Study[11] for the years 2012 and 2014 and the 2013 American Society of Heating and Air-Conditioning Engineers (ASHRAE) Annual Conference.[12]

Next Steps

The team will begin testing an additional refrigerator (10.16.RF-C) and clothes washer (10.16.CW-C) received from the third manufacturer in 2014. To provide a comprehensive analysis, the team will prepare a final report compiling all test data collected after completion of all appliance testing.

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

[12] 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 devices, such as batteries, are still being explored as emerging technologies for their ability to provide permanent load shift (PLS) 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 Demand-Side Management (DSM) Engineering group, with support from the EVTC organization.

Status

SCE has completed the battery energy storage system (BESS) design specification, and the selected vendor is in the process of fabricating the BESS.

Next Steps

Next steps include developing factory acceptance tests, installation of the device, 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.

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. The goal of this effort is to pave 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 Energy
- 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 culminate in alpha and beta testing in 2014.

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 team has

incorporated changes to support recent Title 24 compliance requirements and curriculum modifications in the California Advanced Lighting Controls training program. The project completion date has been extended to the end of Q4 2014.

DR12.04 Title 24 OCST Compliance

Overview

In past funding cycles, SCE funded the development of two studies[13] to introduce OCSTs—formerly referred to as programmable communicating thermostats (PCTs)—into California's Building Code, Title 24.[14] In 2012, OCSTs were incorporated as alternatives in residential buildings and requirements for commercial buildings into the 2013 Title 24 code update.[15] Upon completion of the Title 24 language, the California Energy Commission (CEC) continued the code update by developing Reference Appendices,[16] which provide guidance to the public on implementing the various code measures. The current project provides guidance and support to CEC in developing the Compliance Manual on OCST.

Collaboration

This project is being completed 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 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).*[17] Guidance and tools were provided to determine both OCST applicability for different building configurations and device functionality compliance.

Next Steps

This project is supporting 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 in July 2014. SCE's role as technical advisor/support to CEC will end with completion of the Compliance Manuals.

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[13] 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].

[14] California's Building Code, Title 24 [*available at*: http://www.bsc.ca.gov/pubs/codeson.aspx].

[15] 2013 Title 24 Code Update [*available at*: http://www.energy.ca.gov/title24/2013standards/].

[16] 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].

[17] 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].

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), 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 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 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 and researching the effects of the credit availability on market adoption and grid reliability, as well as the overall environmental impact of the point. 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. Project team members from LBNL, USGBC, and SCE reviewed the research data collected, and USGBC submitted a draft report to SCE for review at the end of Q4 2013.

Next Steps

At SCE's request, USGBC is adding building and market data to the report and will submit a final draft report to SCE for approval by the end of Q1 2014.

DR12.08 DR Pool Pumps

Overview

The purpose of this project[18] 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 Potential[19] and Integration of DR into Title 20 for Residential Pool Pumps.[20]

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 production-ready device is at the SCE HAN lab for final 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 on schedule for completion in Q1 2014.

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 is on schedule to be completed in Q2 2014. The results from this project will be used to inform 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.

Next Steps

SCE will complete the field trial and test of the production-ready integrated pool pump controller device and retrofit pool pump solutions according to plans. The project team will also prepare reports that document the results for each solution.

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

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

[20] 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].

DR12.16 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. This provides products that can be controlled by a smart thermostat with 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 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. 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 planning for this project began during Q4 of 2012, and the project study commenced in January 2013. The laboratory DR evaluation of two systems is complete and final analysis of this evaluation is under way. Many tasks for the field test are also complete, including selection of a customer site, engineering and design of a system, and obtaining of permits from city departments. Construction at the site—which involved removing the existing heating, ventilation, and air conditioning (HVAC) system and associated ductwork, packaged rooftop units and controls, as well as installation of the new VRF system and associated air distribution devices, electrical service, and monitoring instrumentation—is also complete.

Next Steps

Field tests are planned for the summer months of 2014. 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 field study is evaluating the potential and current DR capabilities of climate-appropriate air-conditioning (AC) systems, such as evaporative cooling and variable capacity heat pump systems. 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 HVAC capacity and thermal characteristics.

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. The team has selected and identified the technologies to be implemented, as well as identified project sites, and is currently focused on implementing customer site agreements.

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 Q3 2014.

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

Overview

This project involves 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 will collect and incorporate research information on existing and documented installations with networked technologies from domestic and international research organizations, utilities, manufacturers, and distributors. In addition, the project team will identify a HAN/BAN system for a future field evaluation to assess the system's effectiveness in implementing EE and DR measures.

Collaboration

This project is being 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 system for future field demonstration (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.

Next Steps

SCE is currently reviewing a draft project report developed by EPRI and is expected to approve the report by the end of Q1 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 suggest that additional technology development is needed to effectively communicate FDD signals to networked systems as well as to service providers via cloud-based communication technologies. The team initiated 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.

Next Steps

Plans call for completing the proof-of-concept laboratory tests in early 2014. The next step, slated for Q2 2014, will place the two FDD systems in a field demonstration to enable assessment of their performance under real-life conditions. The project is expected to be completed by the end of 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 developing building energy management control strategies based on the energy analysis conducted for various energy storage solutions, 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

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 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 networks 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. Additional 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 that support SCE's DR-ready objectives. SCE and EPRI continue to secure residential customer sites to participate in the study. The project completion date has been extended to Q4 2014.

DR12.25 Ancillary Services Pumping Equipment

Overview

This project[21] 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) 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.

Next Steps

This project will continue to be implemented in phases. Six units are undergoing safety testing at SCE's MSO labs in Westminister. 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). Equipment installation and project completion is planned before the end of 2014.

[21] Reported as DR11.01 in SCE's Semi-Annual Q3–4 2012 EM&T Report.

DR12.26 Third-Party Programmable Communicating Thermostat Study

Overview

This field study is evaluating the potential of leveraging the existing installed base of internet-based OCSTs (also known as smart thermostats or programmable communicating thermostats) from third parties, including thermostat manufacturers and 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 DRAS initiated DR events 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 are also SCE customers. These vendors entered into agreements with OCST-owning customers that authorized the vendor to 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.

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.

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 Day 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, and paying out incentives to participating vendors.

Next Steps

The third-party vendors reported their findings to SCE by the end of 2013. After reviewing results, SCE will prepare a formal evaluation report and present it to the Demand Response Measurement and Evaluation Committee (DRMEC) by Q2 2014. Depending on findings, this study may lead to a program to take advantage of OCSTs as a viable and growing DR resource.

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 (SONGS). The study will utilize networked pool pump controllers that can initiate DR events using either SCE's 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.[22] After receiving approval for the study in April 2013,[23] 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.

Next Steps

This project will enroll customers in the study, install the control equipment, conduct test events, and analyze results, completing the project in 2014. Successful findings from this study may lead to the creation of a DR program for pool pumps.

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[22] CPUC proceeding A.12-12-017.

[23] 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

Initiated in late 2012, this 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. Engineers will lab test and demonstrate a new architecture that utilizes a smart meter, a ZigBee-to-OpenADR 2.0b gateway, and DRAS. Equipment will be tested in SCE's Advanced Technology Labs.

The project applies the same concept as DR12.29 (KYZ Ancillary Services Gateway), but differs from that project in utilizing a gateway capable of gathering telemetry information from a SmartConnect meter using ZigBee through the customer's network, rather than converting KYZ pulses.

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

The project team identified and acquired an OpenADR 2.0b gateway with the required functionality for testing and recently commissioned use of an OpenADR 2.0b–compatible DRAS. The team will begin lab testing of the proposed architecture.

Next Step

The team's next step is to complete the 30-day lab test, including execution of detailed test cases. The team will also validate the accuracy of telemetered data coming from the DRAS with the smart meter. 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. 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 demand response servers is complete, as is vendor verification into the OpenADR alliance.

Next Steps

SCE plans to install equipment, engage the manufacturer with equipment hardware, conduct field tests, and complete the project by the end of Q1 2014.

DR13.01 ENERGY STAR "Connected" Specifications for Residential Products

Overview

This project covers SCE involvement in the U.S. Environmental Protection Agency's (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 methods[24] 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

[24] 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

*Sub-project initiated in Q3-Q4 2013

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 methods for refrigerators/freezers[25] were published in May 2013. SCE provided several sets of written comments both on SCE letterhead (Q1[26] and Q2[27] 2013) and in conjunction with other utilities via the Consortium for Energy Efficiency[28] (CEE) (Q1 2013). Many recommendations were incorporated, but some recommendations presented opportunities for enhancement in the next revision process.

[25] 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].
[26] Q1 2013 SCE Comments on refrigerator/freezer specifications [*available at*: http://www.energystar.gov/products/specs/sites/products/files/Southern%20California%20Edison%20Comments.pdf].
[27] 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].
[28] Q1 2013 CEE Comments on refrigerator/freezer specifications [*available at*: http://www.energystar.gov/products/specs/sites/products/files/CEE%20Comments_3.pdf].

13.01.02 – Clothes Washers

EPA released a Draft 2 Version 7.0 specification[29] in June 2013. SCE, along with the other California IOUs, provided written comments[30] in July 2013 that focused on both EE and DR aspects of the new specification. DR comments were a direct result of knowledge gained through laboratory testing in DR 10.16. A Final Draft Version[31] was released in December 2013.

13.01.03 – Climate Control

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.[32] At this point, timing of further action by the EPA is unknown. However, SCE 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 Pool Pumps Connected Functionality Discussion Document[33] 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 (DR12.08.01: 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.

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[29] Product Specification for Clothes Washers. Eligibility Criteria Draft 2 Version 7.0 [*available at* http://www.energystar.gov/products/specs/sites/products/files/ENERGY%20STAR%20Draft%202%20Version%207.0%20Clothes%20Washers%20Specification.pdf]

[30] Q3 2013 CA IOU Comments on clothes washer specifications [*available at* http://www.energystar.gov/products/specs/sites/products/files/CA%20IOUs%20Comments%20-%20ENERGY%20STAR%20Clothes%20Washers%20Draft%202%20V7.0%20Specificatio....pdf]

[31] Product Specification for Clothes Washers. Eligibility Criteria Final Draft Version 7.0 [*available at* http://www.energystar.gov/products/specs/sites/products/files/ENERGY%20STAR%20Final%20Draft%20Version%207%200%20Clothes%20Washer%20Specification.pdf]

[32] 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].

[33] 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].

13.01.05 – Clothes Dryers

Work on this product began in Q3 2014, after EPA released a Draft 2 Version 1.0 product specification[34] in August 2013. The California IOUs provided EE-focused comments[35] in September 2013, and SCE provided separate DR-focused comments[36] in October 2013. EPA released a Supplemental Proposal[37] in December 2013 focused on EE issues that did not address DR "Connected" criteria.

13.01.06 – Dishwashers

Work on this product began in Q4 2013, and entailed review of the Product Specification Development Launch announcement[38] made by EPA in December 2013. The new specification will address two major areas: 1) inclusion of a cleaning performance test to ensure efficiency doesn't come at the price of poor cleaning ability, and 2) inclusion of "Connected" criteria. No formal draft specification has been released.

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.

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[34] Product Specification for Clothes Dryers. Eligibility Criteria Draft 2 Version 1.0 [*available at*: http://www.energystar.gov/products/specs/sites/products/files/ENERGY%20STAR%20Draft%202%20Version%201.0%20Clothes%20Dryer%20Specification.pdf]

[35] Q3 2013 CA IOU Comments on clothes washer specifications [*available at*: http://www.energystar.gov/products/specs/sites/products/files/Draft%202%20V1.0%20Clothes%20Dryer%20Comments%20-%20CA%20IOU%2009_24_2013.PDF]

[36] Q4 2013 CA IOU Comments on clothes dryer specifications [*available at:* http://www.energystar.gov/products/specs/sites/products/files/Draft%202%20V1%200%20Clothes%20Dryer%20Connected%20Functionality%20Comments%20-%20SCE%2010_07_13.pdf]

[37] Clothes Dryer Supplemental Proposal [*available at:* http://www.energystar.gov/products/specs/sites/products/files/ENERGY%20STAR%20Clothes%20Dryers%20Supplemental%20Proposal.pdf]

[38] Dishwasher Product Specification Development Launch [*available at:* https://www.energystar.gov/products/specs/sites/products/files/ENERGY%20STAR%20Version%206%200%20Residential%20Dishwasher%20Launch%20Letter.pdf]

5. Project Initiated Q3–Q4 2013

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 (C&S) programs. The conclusions and recommendations being developed by this study are intended to provide a roadmap for SCE to pursue future DR, EE, and C&S activities.

Collaboration

This project was initiated by the Customer Service New Products Development & Launch (NPDL) group and was executed by SCE's Demand Side Management (DSM) Engineering group.

Status

The project team has completed the study of other organizations and is focused on analyzing impacts and making recommendations.

Next Steps

Once findings and recommendations are complete, the results of this study will provide valuable input to SCE as it advances a range of energy activities. For example, the C&S team is looking into developing a study for codifying demand responsive thermostats into the California's Title 24 Building codes. SCE is also studying a strategy (for better management of demand control) of integrating photovoltaics and electric vehicles.

6. Budget

Emerging Markets and Technology Recorded Expenses: 2012–2014 ($)					
Expense Type	2012	2013	2014	2012–2014 Totals	2012–2014 Authorized Funding
Labor	622,051	788,537		1,410,588	
Non-Labor	675,631	1,493,971		2,169,602	
Total 2012–2014 Funding Cycle	1,297,682	2,282,508		3,580,190	8,278,969
Labor	361,391	4,552		365,943	
Non-Labor	768,537	2,014,572		2,783,109	
Total 2009-11 Carryover[39]	1,129,927	2,019,124		3,149,052	4,230,000
Grand Total	**2,427,610**	**4,301,632**		**6,729,242**	**12,508,969**

[39] 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

- 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)
- 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)