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Emerging Markets & Technology Demand Response Projects Semi-Annual Report: Q1–Q2 2015

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)
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
CSI	Customer Solar Initiative
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
IDSM	Integrated Demand-Side Management

IESNA	Illuminating Engineering Society of North America
IOU	Investor-owned utility
ISGD	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
NREL	National Renewables Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
OCST	Occupant controlled smart thermostat
OP	Ordering Paragraph
OpenADR	Open Automated Demand Response
PC	Personal computer
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
RSO	Revenue Services Organization
RFI	Request for Information
SCE	Southern California Edison Company
SGIP	Self-Generation Incentive Program
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 2015* 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 D.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, modernization of the grid, and improved use of generating resources, including distributed resources—the 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 EM&T Program activities over the first half of 2015 is submitted as directed in 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. 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.

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 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 developing 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 SCE stakeholders 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 provide them 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.
- 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.

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

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

In the first half of 2015, SCE completed, continued, and started the EM&T projects in the table below.

Category	Project
Codes & Standards	• Development of Compliance Manual for programmable communicating thermostats and DR-capable lighting systems 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, Demonstrating & Simulation	• Field testing of variable capacity heat pumps and climate appropriate AC systems to understand their DR capabilities • Field and laboratory testing of pool pumps as a viable DR-capable end-use technology • PLS opportunities using batteries • Pilot project to test and evaluate small batteries as residential energy storage units • Establishment of DR capabilities in smart appliances • Laboratory and field testing to understand the DR potential of home building energy management systems • Evaluation of the DR potential of systems using advanced refrigerants • Field testing of hotel guest room controls for DR capability • Demonstrating integration of ZNE communities, including community battery storage • Advanced DR concepts in data centers • Retrofits for low-income multi-family housing, modular classrooms, and a commercial training facility • Feasibility study to understand the potential for DR using conditioned crawl space • Field test of EV's on-board communications capability to geolocate the vehicle for testing DR opportunities
Ancillary Services	• A pumping project to evaluate its potential for serving the ancillary services market • Field test of large batteries to investigate the potential in the commercial and industry segment for fast & flexible DR, non-generation resource (as ancillary service), and distribution grid support opportunities. • Field test of Tesla's residential battery storage systems for fast & flexible DR, non-generation resource (as ancillary service), and distribution grid support opportunities.
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 customer-owned third-party thermostats and use of a home area networked system to control pool pumps • Testing residential energy storage units and expanding residential DR in the Irvine Smart Grid Demonstration (ISGD) project • Study to evaluate DR, deep energy efficiency retrofit, distributed generation, and energy storage opportunities at University of California campuses

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, and to allow their identification in the ETCC website.

3. Projects Completed Q1--Q2 2015

DR12.08 DR Pool Pumps

Overview

The purpose of this project[4] 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[5] and Integration of DR into Title 20 for Residential Pool Pumps.[6]

This project will include field trials of a pool pump with integrated DR capabilities to assess functionality (DR12.08.01), and 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 completing laboratory testing of the prototype at SCE's HAN lab, the pool pump controller received ZigBee Smart Energy Certification[7] and the production-ready device is at the SCE HAN lab for final testing. SCE filed, and received approval for, Advice Letter 2685-E[8] 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 solution.

DR12.08.02 DR Ready Pool Pumps for Residential Retrofit

The retrofit solution identified as part of this project has been commissioned and some initial testing has been conducted. Final report for this project has been completed. Based on the final report showing inconsistencies with the communications to signal DR events, SCE does not plan to pursue this solution

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

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

[6] 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].

[7] http://www.zigbee.org/Products/ByStandard/ZigBeeSmartEnergy.aspx

[8] 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].

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 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.[9] After receiving approval for the study in April 2013,[10] 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. Besides the HAN/Internet pool pump control solution, another project was launched using pool pump load control switches that use the same VHF radio communication platform used for SCE's Summer Discount Plan (Air Conditioning Cycling DR Program). This project is reported under project number DR14.05 DR VHF Pool Pump Study. Additional issues with field installations of the HAN/Internet solution further delayed testing, and the project has been discontinued.

Next Steps

Based on technical issues continuing to delay this project and the findings from the VHF pool pump study (DR14.05 DR VHF Pool Pump Study) that a DR pool pump program would not be cost effective, this project has been discontinued.

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

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

DR13.09 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 not yet 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, and determine what verifying data is sent by each device to the utility. 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 should serve as the basis for standards development, may be aligned with current and future DR needs for SCE, using 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 a third party vendor with project management from SCE's TTC.

Status

The project team has cancelled the remainder of this project. After completing elements of Task 1, an effort was undertaken to re-scope the project to focus on developing usage profiles for various residential electric loads. The budget allocated for this project could not cover the costs associated with gathering this information at the desired scale. Several alternate courses of action were considered, but ultimately the SCE team determined the budget would best be spent on other activities.

Next Steps

No further action.

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. 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 provide guidance for SCE to pursue future DR, EE, and Codes and Standards 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.

DR14.05 DR VHF Pool Pump Study

Overview

As SCE pursued options for a DR pool pump program and determined that a HAN solution (sending signals via the AMI network through smart meters) was not feasible due to limitations with the control platform, a quick-to-market and scalable solution needed to be identified. A solution using similar load control switches and the one-way VHF radio network used in SCE's Summer Discount Plan - SDP (Air Conditioning Cycling DR Program) was selected. Customers were recruited via a direct mail and e-mail campaign and the control devices were installed by a selected contractor. The majority of pool pump test events were called concurrently with SDP events, with an additional three pool pump-only test events called toward the end of the project. Over 115 customers participated in test events and surveys showed high overall customer satisfaction with the project.

Collaboration

This project was undertaken with cooperation from various stakeholders at SCE.

Status

Test events concluded in November of 2014. Results from the test events were mixed. Actual load drop for pool pumps that participated in the DR events was, as expected, at 1.5 kW per device. However, the overall average load drop per device was lower than expected, at 0.5 kW. Analysis shows this most likely resulted from participants changing the scheduled runtime of their pool pumps. Additional analysis determined that a large scale program would not be cost effective and would not provide significant DR savings.

Next Steps

The project has been completed.

4. Projects Continued Q1–Q2 2015

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[11] of SCE's amended testimony to support 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

In December 2010, the project team conducted extensive lab testing of a prototype device received from the vendor. 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[12] 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. Participating customers were placed on a Time of Use (TOU) rate to test additional operating modes during the second half of 2014. Final testing was completed during the 1st half of 2015.

Next Steps

Testing at ISGD has been completed, but the RESUs will continue to be used and monitored throughout the duration of the project - scheduled to end in mid-2015. A final report, slated for submission at the conclusion of the project, will provide information on the feasibility of using these types of batteries as a DR resource, and any additional project findings.

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[11]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].

[12]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)[13] 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, 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, and 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 to support 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 experiments were conducted during the remainder of 2014.

Next Steps

All planned experiments have been completed and analysis of collected data will be included in the final project reports slated for the second half of 2015.

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[13] 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].

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, and investigate and define telemetry and control requirements. The project will also help identify and develop recommendations for any regulatory enhancements 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 fully executed the interconnection agreements, and the BESS is in full operation performing PLS at the site daily. Data collection is in progress.

Next Steps

SCE will analyze the BESS performance data, and produce a report. The report will be submitted in the second half of 2015.

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 can 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 make variable refrigerant flow (VRF) systems DR-ready. 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 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 will 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 the four-zone VRF testing stand.

Collaboration

This project is being executed in collaboration with a third party vendor, 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 continuing for the spring & summer months of 2015. SCE will analyze the results and complete a final report in Q4 2015.

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 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 a third party vendor, which conducts research on issues related to the electric power industry.

Status

The project team planned during Q4 2012, and commenced the study in January 2013. Equipment construction is complete, and the vendor has implemented monitoring equipment in the field. The commissioning phase has been completed. Data collection is in progress.

Next Steps

The project team has installed the equipment and engaged the manufacturer with equipment hardware prior to summer 2014. The manufacturer has committed resources to update the field product. Field tests are planned for the summer months of 2015. SCE will analyze the results and complete a final report in Q4 2015.

DR12.19 Field Testing of Networked Systems for Fault Detection and Diagnostics

Overview

This project is evaluating the capabilities of currently available networked-based FDD systems in laboratory and field settings. The project will focus on the assessment of the systems' effectiveness in implementing utility DR programs, and evaluate their ability to collect, display, and communicate system fault detection and diagnostics (FDD) information when linked with residential and light commercial HVAC systems. Network system control and automation functionality to determine the potential for automatic response to FDD signals to optimize HVAC system performance is being explored.

Collaboration

This project is being executed in collaboration with a third-party vendor, 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 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 has been demonstrated at four sites in SCE's service territory.

Next Steps

Having completed the data collection and analysis of the field assessment portion of the project, a final report is being developed by the vendor. The final report will be completed by the end of Q3 2015.

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

Overview

Many energy storage technologies aim to permanently reshape the building load profile by shifting peak-hour loads to non-peaking hours of the day. 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, and an energy storage technology report.

Collaboration

This project is being executed in collaboration with SCE's PLS program, Field Engineering, DSM Engineering group, and a third party vendor, which conducts research on issues related to the electric power industry. Lumina and NREL were subcontracted to develop the tool.

Status

A draft tool has been developed and demonstrated to SCE stakeholders for detailed technical review and feedback. This primary feedback is now being incorporated into the tool for finalization. Product handoff and training on the tool are expected to occur in Q4 of 2015.

Next Steps

Final review commentary is being addressed by the development team. Once completed, the tool will be uploaded and made publicly available on SCE's Online Calculation Tools webpage. This multi-year project is scheduled for completion by Q4 of 2015.

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[14], 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:

- 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 has completed the Field and Lab trials with collected findings on data reporting on a Friedrich Window AC (Internal DR module) and ThinkEco Modlet unit tested in EPRI's Knoxville laboratory and the ThinkEco Modlet units deployed in residential homes in the Southern California Edison Service territory. The draft report will also include recommendations for product enhancements to better support SCE's peak load reduction objectives for connected devices. Finalizing drafts on field and lab data collection and analyses for the project report.

Next Steps

Finalize the field and lab data collection and analyses for the project report. The final draft report is expected to be submitted to SCE in Q4 2015 for approval.

[14] SCE signed an agreement called Buildings III Supplemental Project with EPRI in December 2013 to collaborate with EPRI on RD&D activities in improving energy efficiency, environmental stewardship, and demand response in residential and commercial buildings. The Buildings III Supplemental Project has five sub-projects, A through E.

DR12.25 Ancillary Services Pumping Equipment

Overview

This project[15] aims to evaluate the potential for customers with water pumping equipment to participate in an Ancillary Services DR program. The project team planned 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 emergency DR statewide. According to initial projections, by 2014 approximately 6% of Agricultural and Pumping customers could participate in an Ancillary Services program.

Collaboration

This project is being conducted in collaboration with SCE's Energy Education Center (EEC)-Tulare, New Program Development & Launch C/I Solutions Pilots, Business Customer Division (BCD), Field Engineering, and the Meter Services Organization (MSO).

Status

The project team was unable to execute any work on DR12.25 during Q1-Q2 2015. To optimize resource utilization, project management of DR12.25 will be transferred to the New Program Development & Launch C/I Solutions Pilots team, effective July 1, 2015.

Next Steps

Device testing was completed in March 2014. Due to expiration of the communication vendor contract in December 2014, SCE will take actions to reactivate and extend the contract through December 2015. Due to expiration of the customer contract and the fact that the previously selected site was unsuitable for the project, C/I Solutions Pilots will coordinate with BCD to contract with a customer within a radius from EEC-Tulare to avoid incurring additional project costs and schedule delays. To ensure compliance with SCE Cyber Risk policy, NPDL C/I Solutions will submit the project for Cyber Risk review and take actions as directed by the review team. To fund electrical work required for the project, NPDL C/I will obtain approvals to proceed with electrical work at the final customer site. It is expected that all contract, cyber risk review, and funding activities will be completed in Q3 2015. It is expected that customer site selection and contracting, field equipment installation, and field communication testing will occur during Q4 2015.

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

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 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 organization 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 OpenADR 2.0a, and the second vendor is in the certification process. Data loggers have been installed and information is being collected.

Next Steps

SCE installed power monitoring equipment and initiate accounts on the SCE OpenADR 2.0 test server. Demand Response event scheduling with data analysis will commence. Project completion is anticipated in Q4 2015.

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.

History has shown that ENERGY STAR specifications and test methods[16] often are incorporated in whole or in part into mandatory performance standards adopted by DOE or state agencies, such as CEC. 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
- Comment on the DR verification test methods based on prior lab experience, and alignment with eventual DR program deployments

[16]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].

This project is divided into six sub-projects; each addresses a product, as shown in the table below. Updates on active projects are included in the Status section.

Product	Project #	Status
Refrigerators/Freezers	13.01.01	Completed Q2 2013
Clothes Washers	13.01.02	Completed Q1 2014
Climate Control	13.01.03	In Progress
Pool Pumps	13.01.04	Completed Q1 2015
Clothes Dryers	13.01.05	Completed Q2 2014
Dishwashers	13.01.06	Completed Q2 2015

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

13.01.03 – 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 memo[17] at the end of Q2 2014. SCE did not provide comments on this memo but has been participating in EPA webinars and other supporting activities with CEE and the CA IOUs. In Q1 and Q2 2015, EPA has held numerous discussions[18] regarding the methodology that would qualify smart thermostats to use the ENERGY STAR logo.

13.01.04 – Pool Pumps

The EPA released a draft 3 document for "Connected" pool pump criteria[19] and a draft 2 test method to validate DR in Q4 2014. SCE worked with several other utilities and key players to provide comments to CEE[20] in Q1 2015. EPA released a final draft test method and specification in Q1 2015 followed by the final test method and specification a month later at the end of Q1 2015.

13.01.06 – Dishwashers

EPA released a dishwasher demand response criteria proposal[21] in Q1 2014. SCE reviewed the document and had no further comments. A final draft specification was published at the end of Q1 2015 and the final specification a month later in Q2 2015.

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

[18] Climate Controls website http://www.energystar.gov/products/spec/connected_thermostats_specification_v1_0_pd

[19] Pool Pump website http://www.energystar.gov/products/spec/pool_pumps_specification_version_1_0_pd

[20] CEE Comments to EPA [available at http://www.energystar.gov/sites/default/files/CEE%20Comments_0.pdf]

[21] Dishwasher website http://www.energystar.gov/products/spec/residential_dishwasher_specification_version_6_0_pd

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 ready for immediate enrollment and participation in utility DR programs.

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. 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 explores and documents 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 completed the Task 1 survey of technologies and has identified several promising technologies for laboratory and field demonstrations.

For lab testing, a CO2 transcritical booster system has been selected as the test unit. This system configuration has been widely adopted in Europe and is gaining traction in the US. It shows promise form an energy efficiency standpoint, but may have issues operating during heat waves in areas with high ambient temperatures. The booster portion of the system is intended to enable operation during these times. Tests evaluated performance across a range of ambient conditions and the DR implications/opportunities in this operating mode. Testing was well underway at the end of Q2 and final results are expected in early Q3.

After a thorough investigation of potential system types, equipment suppliers, and customer sites, the project team selected a MyCom ammonia/CO2 system for installation at Imuraya USA in Irvine as the field portion of this project. The system is a new-to-the-US breed of small packaged refrigeration systems that

take advantage of the superior thermodynamic properties of ammonia by using a small charge ammonia system to cool a secondary fluid that is pumped to provide cooling where it is needed. The small ammonia charge and placement outside of occupied spaces significantly reduce the health and safety concerns of using this type of system. Imuraya is a Japanese mochi dessert manufacturer whose products must be manufactured and stored at sub-zero temperatures. The new system will be installed alongside their existing R-507A system to supply the ~1500 sf walk-in storage freezer. Both systems will be operational, allowing the project team to switch back and forth between the two units as needed. In Q3-4 2014, the project team worked to finalize these major project choices and began the process of finding a refrigeration contractor and solidifying the relationships between the parties. These discussions continued through Q2 2015 with a planned installation beginning in Q3 2015. Development of test plans, including DR scenarios, will occur in Q3 and Q4.

Next Steps

The project team will continue progressing on the laboratory and field demonstrations. The project is slated for completion in Q4 2016.

DR14.01 Deep Retrofits in Low Income Multi-Family Housing

Overview

This ZNE Deep Energy Retrofit sub-project will showcase a range of high-efficiency IDSM technologies within a 30-unit subset of a 100-unit 1970s low-income multi-family (LIMF) development. These thirty units will be retrofitted to ZNE levels, with a 75kW PV array reducing grid load. Battery storage is being considered, and with smart thermostats can deliver even more energy savings during DR events.

Collaboration

EPRI is the project lead, with the CEC, SCE, Southern California Gas Company, BIRAEnergy, and the building complex owner (LINC Housing) acting as project partners.

Status

Thirty "Smart" Programmable Communicating Thermostats were installed in July, 2015 in the thirty units that have been retrofitted. They have now begun data collection and the testing plan is being developed. Ten each of three brands were installed: Trane, Nest and Ecobee.

Next Steps

The project team intends to develop a replicable and scalable financial model for implementing LIMF ZNE retrofits across SCE territory and beyond. After the tests are completed of the 3 brands of Programmable Communicating Thermostats, an additional 70 are planned to be deployed for DR testing at the same MF complex. Completion is scheduled for Q1 2017.

DR14.07 Conditioned Crawl Space (CCS)

Overview

This DR project is being conducted within the larger CCS Field Study, which is endeavoring to discover if energy efficiency improves when the building envelope is modified by moving the pressure boundary (conditioned space) of the building envelope from the framed floor to the earth grade underneath the floor.

A second important element is to research the possibility of replicating these efficiency measures in modular housing. This housing sector is a significant segment of the housing/"relocatable" school building stock in SCE territory.

Finally the project will help SCE drive new EE technologies by developing cost-effective/ incentive-ready emerging technology measures around the CCS area.

This project will break ground on existing and new construction with CCS, using the PCT to signal DR events. The DR goal is to be able to shut off the AC compressors, but still run the fan to circulate the cool air from beneath the house, keeping the house cool through the DR event.

Collaboration

This project was initiated by the EM&T NPDL group and is being executed by one of its project managers. EM&T is collaborating with the Codes and Standards program to maximize the data derived from this field test research for the 2019 Code Cycle.

Status

Test sites have been chosen, customer agreements signed and construction contracts are in process. The data collection devices have been installed in 4 homes in 4 CZs within SCE territory. Baseline data is being collected. Still working to get the modular site(s) secured.

Next Steps

The next step is to install the proposed measures in the homes and compare data collected to the baseline. Completion is scheduled for Q1 2017. A "Phase 2" Is being planned to study High Performance attics on the same homes as the CCS study, which will push the completion date out one year.

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

Overview

This project evaluates the DR capability of VCHP systems. The tested products will include traditional "American-style" high-static ducted systems. Testing will focus on three products. 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 include conducting a survey of technologies followed by 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 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 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

Vendor has fully completed 6 tasks and associated deliverables. So far, the vendor has completed the technology survey, selected/procured equipment for lab and field assessments, completed field site selection, and made progress on lab and field data collection. Preliminary lab and field findings have been shared and discussed.

Next Steps

Vendor will continue lab and field assessments. Vendor will share preliminary data for lab and field assessments as it becomes available. Vendor is scheduled to conduct the DR field assessment portion in September, 2015. The project is slated for completion in Q4 2015.

DR13.08 EPRI EB III D – Advanced Energy Efficiency and Demand Response Concepts in Data Centers

Overview

The goal of this project is to conduct a 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, energy efficiency, demand reduction, demand response, and cost-effectiveness of the technologies. Steps in the project will involve identifying 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:

- Measurement and monitoring equipment has been installed in the customer site, but their current data center loads are too low to conduct DR tests. Customer is adding load to their computers, to allow DR testing.
- Contractor has set up measurements in their own data center lab. Using a computer program that loads the computer server, contractor can increase server load to where DR testing will be possible.

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.

5. Projects Initiated Q1–Q2 2015

DR13.05 Demonstrating Grid Integration of ZNE Communities

Overview

This is a partnership, through a CPUC/CSI solicitation, with EPRI as the awardee and other stakeholders, including a large production homebuilder (Meritage) to design, build and monitor a new ZNE residential community (~20 new homes) in Fontana. SCE will act as the project's lead on emerging DSM technologies, battery community energy storage integration, electrical grid optimization, and post-monitoring. The main deliverable of this project will be a detailed report summarizing project findings and recommendations to help overcome market barriers to community-scale ZNE homes.

Collaboration

This project is in collaboration with EPRI, the CPUC, Itron, Meritage Homes, BIRAenergy, and several other private companies. EPRI is the overall project lead, Meritage Homes will build and sell the 20 ZNE homes, BIRAenergy will provide sustainability consulting and SCE will act the host utility, technology lead, and lead on grid-side matters.

Status

The ZNE homes have been designed and are publicly for sale in Fontana, CA in a community called Sierra Crest. A variety of public announcements and media events have occurred by various members of the project team to announce this partnership and the ribbon-cutting of this community. More than half of the homes have been sold; two are in construction.

Next Steps

The next step is to continue construction of the 20 ZNE homes. In parallel, energy storage configurations are being planned and designed by all project stakeholders, for deployment soon after construction of the homes. A detailed monitoring plan will be developed shortly after that.

DR14.02 ZNE Retrofit Commercial Training Facility

Overview

This is a partnership with a large training facility (Electric Training Institute) in Commerce, CA to retrofit the existing 140,000 SF commercial building towards achieving Zero Net Energy (ZNE). SCE will act as the project's expert and lead on emerging DSM technologies, including battery storage integration and post-monitoring. The main deliverable of this project will be a detailed report summarizing project findings and recommendations to help overcome market barriers to ZNE commercial retrofits.

Collaboration

This project is in collaboration with the Electric Training Institute and many of their project affiliates, including Environmental Building Strategies, PDE Total Energy Solutions, GE, Lutron and many others.

Status

The retrofit project is slated to begin construction Q4 of 2015. ETI is seeking participation in several SCE programs, including SGIP and Savings By Design.

Next Steps

SCE will continue to support ETI on all matters DSM through the project's construction, once near-completion, a monitoring plan will be finalized for ongoing technology feedback. SCE will continue to gauge ETI's interest for participation in DR programs.

DR15.11 EV Enabled DR

Overview

This project leverages an electric vehicle's on-board communications capability to geolocate the vehicle for testing DR opportunities. Similar to the 3rd party Nest PCT model, Tesla would recruit customers who already own Tesla EVs and future owners to encourage them to participate in selected SCE DR programs. OpenADR 2.0 signals generated by SCE would communicate with Tesla's cloud-based control system for DR-compatible load control equipment, embedded in the electric vehicle, to initiate a DR event. The event could include dropping load and increasing load by initiating charging when the EV battery is not being charged.

Collaboration

This project is being conducted in collaboration with SCE's DSM Op Support, Corporate Communications, RSO, Call Centers and AT organization.

Status

The customer agreement has been approved by SCE legal department and the co-branding request has been approved by SCE's corporate communication department. Customer is reviewing the customer and trademark license agreement (TLA).

Next Steps

Next steps include executing the customer and TLA agreements, enrolling customers, receiving approval from customers to share data, deploying test events, collecting data, performing data analysis and completing the final project report. In parallel, support the development of the fast and flexible DR tariff/program.

DR15.12 Residential Automated Demand Response Using Stationary Battery Storage

Overview

This project demonstrates a targeted Residential Automated Demand Response project with Tesla using their stationary residential battery storage systems. This project would demonstrate fast & flexible DR, distribution grid support, and aggregated non-generation resource (as ancillary service) in the wholesale market. Some of the demonstration sites would target the Preferred Resource Pilot (PRP) area.

Collaboration

This project will be conducted in collaboration with SCE's DSM Operations Support, Corporate Communications, RSO, Call Centers and AT organization.

Status

The residential battery storage systems are expected to be deployed within SCE service territory by end of 2015.

Next Steps

The customer sign up and testing activities will be conducted in 2016.

DR15.13 Commercial/Industrial Automated Demand Response Using Stationary Battery Storage

Overview

This project tests the potential for Commercial and Industrial segment to provide the following identified objectives of this demonstration: fast & flexible DR, non-generation resource (as ancillary service), and distribution grid support.

With large battery capacities (1 MW & 2.8 MW) concentrated in only two locations, the demonstration could explore the opportunity for a more cost-effective program in the commercial and industrial sector.

The demonstration may also help SCE evaluate performance issues with the batteries and PV in place, validate energy efficiency and load profile changes, and identify and mitigate any power quality and voltage fluctuation issues.

Collaboration

This project will be conducted in collaboration with SCE's DSM Operations Support, and AT organization.

Status

The stationary battery storage systems are expected to be deployed in the near future.

Next Steps

The customer sign up and testing activities will be conducted in Q4 2015 and continue into 2016.

DR15.09 Integrated Campus Energy Storage Project- CSUF

Overview

The project is to connect 500 kW of Lithium Ion battery storage to the 480 volt system at California State University, Fullerton. The energy storage system incorporates Green Charge Networks (GCN) control software to minimize demand from the Edison system. The GCN software will manage generation from the co-generation and PV plants on campus.

Create understanding and methodology for incorporating energy storage with distributed generation, and/or co-generation capabilities, vehicle charging, and micro-grid capabilities

Collaboration

This project was undertaken with cooperation from various stakeholders at SCE, P2S Engineering, and CSUF.

Status

Project has been stalled with issues around SGIP incentive issues. Potential opportunity for collaboration with DR15.15 UC Deep Energy Efficiency Project.

Next Steps

Complete system design, and proceed with project.

DR15.14 Real Estate/Transportation Proof of Concept Study

Overview

The demonstration project objective is to link building energy retrofits with electric transportation system linking buildings to public transportation. To scale adoption of key technologies including energy efficiency, energy storage, distributed generation, charging stations, and electric vehicles

Proof of concept that includes SCE commercial customers and local business improvement district, with city and constituents as benefactor. Advanced technologies are available, but packaging them with tax credits and financing in a project has had limited traction.

Collaboration

This project was undertaken in collaboration with ET and various other internal stakeholders at SCE, Silicon Beach cities, Los Angeles Metro, and Business Improvement Districts.

Status

Finalizing proposal for project with Los Angeles Metro and key companies in Culver City to provide electric vehicle and electric shuttle options for getting to and from work, hospitals, entertainment and shopping and regional light rail. Project to demonstrate dissimilar companies with appropriate attributes can leverage tax credits to reduce first costs on environmentally friendly transportation.

Next Steps

Meet with Los Angeles Metro and others to finalize scope of work and prepare proposal for phase two of project.

DR15.15 UC Deep Energy Efficiency Project Study

Overview

The University of California is a large and diverse energy user with facilities across the state, including ten campuses, five medical centers and various other facilities that in total make up over 130 million square feet, with a peak demand of 400 MW and annual usage of 1.8 billion kWh and 140 million therms. Facilities include over 40 million square feet of energy intensive research laboratory and hospital space that give the entire system an average energy intensity of 157 kBTU/sq ft, almost double that of an average office building. Project will involve evaluating deep energy retrofit, demand response, energy storage, and distributed generation opportunities. This will include investigation of sustainable water savings opportunities and high performance refrigerant technologies with reduced or no global warming potential

Collaboration

This project was undertaken with cooperation from various stakeholders at SCE and University of California Office of the President (UCoP).

Status

This project was recently implemented. White paper has been prepared for review with UCoP and agreement on first phase efforts

Next Steps

Continue identifying and assigning project engineer to manage effort. Meet with UCoP for project planning purposes.

DR15.16 Electric Water Heater Study

Overview

Over the last five years heat pump water heaters in the residential market have continued to be refined, and have shown increased market acceptance, especially outside California. Recently, several manufacturers have produced food grade heat pump water heaters that may fit with small restaurants that have need for hot water, but do not have full-sized dish washers. The DR tactics and planning study identified over 100 MW of DR technical potential in SCE service area from residential and commercial electric water heaters.

Implement field study of selected commercial and residential sites with electric water heaters (resistive and heat pump water heaters) to verify savings and DR potential, including load banks.

Collaboration

This project was undertaken with cooperation from various stakeholders at SCE.

Status

This project was recently implemented.

Next Steps

Continue identifying and assigning project engineer to manage effort.

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DR15.17 University Data Analytics Study

Overview

Ecovox analytics platform at Welch Hall and the Central Plant at California State University, Dominguez Hills (CSUDH) increases system visibility and improves the management of building mechanical systems through better detection of events that waste energy or adversely affect occupant comfort. Building efficiency monitoring services provide the basis of a continuous commissioning process, energy flow analysis, and distributed energy resources management. Evaluate energy management tool for campus, impacts of commissioning, interaction with grid and available distributed energy sources, and micro-grid capabilities. Project to also include data analytics, central plant process flow, co-generation plant, distributed energy resources performance analysis.

Collaboration

Collaboration will be with the Southern California Gas Company.

Status

The project has been initiated with the Ecovox product installed and operational. Obtaining access to the CSUDH system succeeded; currently reviewing system performance.

Next Steps

The next step is to complete the project and prepare an engineering report.

6. Budget

Emerging Markets and Technology Recorded Expenses: 2015 Q1-Q2 ($)		
Expense Type	2015	2015-2016 Authorized Funding
Labor	423,643	
Non-Labor	179,131	
Total 2015-2016 Funding Cycle	**602,774**	**5,844,313**

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)