



Startup
Community Energy Labs
 Portland, OR

Host
Southern California Edison



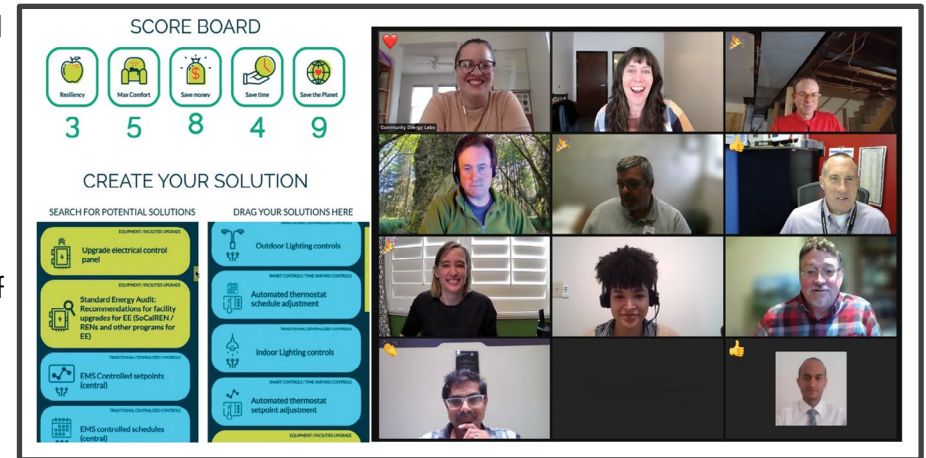
Technology Solution

In 2019, the U.S. commercial sector consumed 18 quadrillion Btu of primary energy, with the municipal, university, and school (MUSH) segment making up 28% of total commercial floorspace. Electrical end uses in this sector have huge energy efficiency and peak shaving potential, but fewer than 10% of MUSH customers use advanced controls due to lack of awareness, competing objectives, and limited capacity to operate and maintain state-of-the-art systems.

This project was launched to test an innovative engagement strategy and Internet-of-Things (IoT) control platform developed by Community Energy Labs (CEL) for improving customer uptake of and experiences with emerging technologies and utility offerings. Interactive workshops increase understanding of energy use, technology opportunities, and utility rates and incentive programs among building operators, occupants, and other stakeholders. CEL's IoT platform features a user-friendly interface enabling facility managers and occupants to meet comfort, performance, cost savings, and decarbonization goals based on wireless sensors, intelligent and distributed controllers, and machine learning software.

Project Overview

This project focused on piloting CEL's customer engagement strategy as an initial step in assessing the scalability of grid-interactive connected building products and services when combined with utility offerings for commercial customers—such as flexibility incentives,



Interactive workshops help customers understand the benefits of building energy technologies and utility offerings.

non-wires alternatives, time-of-use (TOU) tariffs, and demand response and energy efficiency programs—that reward the shifting, shedding, and shaping of building energy loads

CEL, partnering with Southern California Edison (SCE) and EPRI, scaffolded six 2-hour user experience research and education workshops that were attended by MUSH building occupants, operators, and administrators, primarily from elementary and secondary school districts. To test how stakeholder preferences interact with smart building control of space conditioning, electric vehicle charging, and onsite solar and battery systems, CEL explored answers to the following questions through a series of experiments involving end-use loads and energy system interfaces:

Workshop 1: Discover personas through card-sorting exercises – What do customers and end users believe drives energy usage? How do they perceive relationships between usage, carbon emissions, and costs?

Workshop 2: Explore mental models through journey mapping – What do customers believe about end-use technologies? Does this differ by persona?

Workshop 3: Identify persona journeys through gamification – How do customers operate end uses to meet their goals? Does this differ by persona?

Workshop 4: Interact with utilities – Why do customers engage, or not engage, with utility tariffs/programs?

Workshop 5: Dive-in customer/technology interaction experience – What do customers like/dislike about their experience with building energy management systems and outcomes? What is not currently addressed by today's technology?

Workshop 6: Unroll service blueprint – What have we learned about engaging customers in the technology as a pathway to engaging in utility programs/tariffs?

Results & Learnings

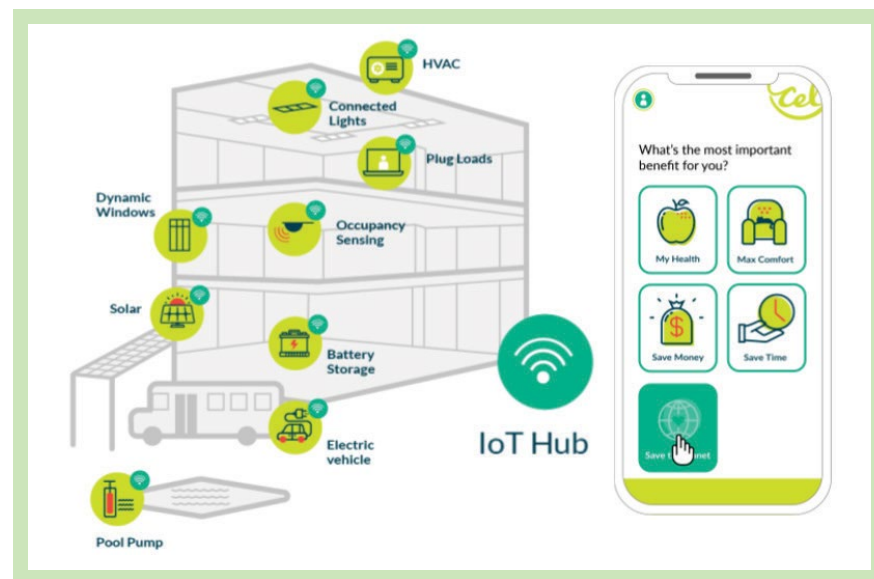
The workshop series engaged a total of 33 participants, characterized as follows:

- 60% of participants were facility managers, architects, maintenance directors, district energy managers, or administrators in charge of facilities at municipalities and K-12 school districts.
- 51% participated in at least 2 hours of workshops and follow-up interviews regarding energy end uses, building controls, space conditioning, lighting, and utility programs and tariffs.
- 27% of registrants participated in a minimum of 8 hours of workshops and 1:1 conversations, with a

subset of school maintenance, facility, and energy management staff forming a core group devoting more than 12 hours of time.

Key customer insights include the following:

- Energy professionals and building operators are heavily impacted by outages and aging equipment and see their primary responsibility as serving occupants followed by keeping costs low and following district policies. Even the best informed have little insight into TOU rates and what drives demand charges, despite wanting to better understand.
- Customers articulate a variety of business challenges that could be addressed by building and equipment controls, such as constant manual adjustment (through programming or bypass) of thermostats; poor visibility into grid conditions, indoor air quality, and solar PV output; and difficulty understanding which end uses and conditions drive energy consumption and bills.
- When forced to choose solutions to the competing demands of operating a building cost-effectively without disrupting occupant comfort, operators prefer pragmatic time-saving solutions such as sensing, automation, and control as well as user-friendly interfaces as a scalable means to communicate with occupants.
- K-12 users will continue to opt out of utility programs, even at great expense (one district gave up \$550,000 in annual incentives), if participation



CEL's IoT system and user interface provide monitoring and control capabilities.

forces operators to choose between cash and occupant comfort. On a scale of 1 to 5 (least to most likely), the willingness to participate in programs without smart controls averages between 2 and 3.

- Participants expressed strong willingness to pilot and adopt AI-based control technology that can autonomously manage demand charges—particularly during unoccupied periods—and allow flexible and tailored adjustment of zone comfort controls.

Based on workshop experiences and interviews, four school districts in SCE's service territory and three districts elsewhere in California and in Washington expressed strong interest in being considered for follow-on pilot testing of CEL's technology.

Implications & Next Steps

Drawing on learnings from this project, CEL plans enhancements to its IoT platform and collaboration with EPRI, SCE, and additional utilities focused on the interest of commercial customers in addressing the

loads that drive demand charges without decreasing occupant comfort. Customer interfaces will be updated to incorporate new dashboards for building operators and occupants that provide insight and rewards for being good grid stewards, such as quantifying the saving on demand charges or other benefits salient to specific end users.

CEL also is developing the control capability to respond to local load management pricing, circuit loading, and other types of grid capacity constraints, and the company plans to work with utilities in identifying potential levers, in terms of carrots and sticks, and conducting field tests focused on engaging customers in managing bulk and local distribution constraints. Key next steps are to deploy CEL technology in a handful of representative small to mid-size building types exposed to time-varying utility tariffs or other demand-shaping signals. Information gathered over a single heating and cooling season in multiple climate zones will provide generalizable insight on impacts that programs and tariffs coupled with CEL technology could provide.

Small-scale commercial deployment will apply CEL technology for delivering customer benefits while (1) determining the location-specific value of building flexibility inclusive of behind-the-meter distributed energy resources and electrification; (2) estimating the value that specific customer segments with similar end-use load types could provide to the grid; and (3) assessing other incentive/technology combinations for providing grid services. Early experience will guide scale-up using combinations of rates, incentives, and technologies for promising customer segments and distribution system applications.

TESTIMONIAL: Community Energy Labs

Working with SCE, other utilities, and their customers was fantastic. Before even concluding our customer engagement workshops, we learned that one of SCE's school district customers was already wondering when a pilot that included our technology was going to start!

TESTIMONIAL: Southern California Edison

The experience with Community Energy Labs and EPRI has been utterly amazing. Early on, we did not know what we were getting into, but the process and outcome turned out to be more than we could have expected, generating useful insights that SCE will put into practice in working with our customers.

TESTIMONIAL: EPRI

Through the workshop series, we were able to gain new understanding of energy management needs and experiences in schools from the perspective of operators, occupants, and administrators—how well they understand end-use loads, distributed energy resources, and rate structures, as well as how control strategies may fit into this segment's operational routine and culture.

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