AT A GLANCE

Residential Distributed Energy Resource Management Systems

Center for Sustainable Energy™

Exploring how homes and smart technologies might play a greater role in electrical distribution and grid management to meet statewide energy efficiency goals

The Smart Home Study was a multi-partner research project in the San Diego area with funding from the California Energy Commission.

WHAT IS THE SMART HOME STUDY?

As distributed energy resources (photovoltaic [pv] solar roofs, electric vehicles [EV], home battery storage, etc.) and smart devices (EV chargers, thermostats, and appliances) become more common in homes, there is greater opportunity to effectively use these technologies to meet both consumer and grid needs. Demand response, or load shifting, can help reduce stress on the electric grid during peak periods, and when paired with time dependent rates, ensure residents are paying the lowest amount for their energy consumption.

The Smart Home Study tested how a residential distributed energy resource management system (RDERMS), designed by project partner Itron, could control and optimize EV charging and home battery storage use based on grid and customer needs. RDERMS has the potential to reduce peak loads, lower grid costs and increase reliability by using automated data analytics and web-enabled communication that connects building energy technologies and the grid.

RDERMS was installed in 100 homes in two climate zones in SDG&E territory to assess the various ways smart homes can connect with a smart grid.

> *"AESC decided to take on the role as project administrator for the Smart Home Study because we are driven to unlock the potential massive benefit of intelligent Behind the Meter (BTM) DER management. This project allowed us to work with CSE to bring the vision of tomorrow's grid into focus — a future which consists of intelligence-optimized smart loads and DERs driven by dynamic price signals to achieve grid balance."*
>
> – John Clint, Director, Distributed Energy Resources, Alternative Energy Systems Consulting

One simple mission —

DECARBONIZE.™

WHAT DID CSE PROVIDE?

CSE staff were the lead data scientists on a team led by Alternative Energy Systems Consulting, that included experts from the technology developer Itron, electric vehicle charging leader Oxygen Initiative, and the local utility San Diego Gas & Electric (SDG&E). CSE was chosen to lead sample design as well as tariff analysis and modeling activities and to support overall knowledge transfer.

WHAT WERE THE OUTCOMES?

Using a variety of existing and modified SDG&E retail utility rates, CSE researchers modeled the greatest and least energy cost-savings based on each study home's electrical consumption, performance of its energy resources and electricity pricing.

This project showed that smart home technology such as RDERMS, when used with time-varying rate structures, could encourage residential customers to shift demand to periods of high renewable generation without increasing utility costs. Additionally, RDERMS can provide California system operators, regulators, and utilities with the ability to promote grid-beneficial consumption and behavior through automation, intelligent control, and price signals.

BENEFITS OF RDERMS

- Lower consumer electricity costs
- Greater reliability and resiliency – reduce dependency on a centralized resource system, particularly during power safety shut-offs
- Increased safety – less reliance on fossil fuel resources and reduced strain on equipment
- Economic development – create demand for storage and renewables; promote workforce training and development
- Environmental benefits – encourage efficient energy use and advance toward goal of 100% carbon-free electricity

WHY CSE?

Center for Sustainable Energy® is a nonprofit with one simple mission — decarbonize. We offer clean energy program administration and technical advisory services, working nationwide with energy policymakers, regulators, public agencies, businesses and others as an expert implementation partner and trusted resource.

Contact us to take advantage of our expertise and services supporting sustainable, equitable and resilient transportation, buildings and communities.

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