GO solar CALIFORNIA

CSI RD&D PROGRAM

Improved Technology

Grantee:
Sunpower Corporation

Partners:
DNV GL, Sandia National Laboratories, Ice Energy, ZBB Energy, University of California, San Diego, Pacific Gas & Electric, Redding Electric Utility, Kohl's

CSI RD&D Funding:
$1,385,286

Match Funding:
$747,326

Project Timeframe:
2011 – 2015

RD&D Project Portal:
calsolarresearch.ca.gov/csi/69

Photovoltaics and Advanced Energy Storage for Demand Reduction

OVERVIEW AND OBJECTIVES

The overall goal of this project was to demonstrate that the integration of photovoltaics (PV) and energy storage (ES) is of higher value than either technology alone. SunPower originally proposed a team that included three energy storage vendors (Ice Energy, ZBB Energy, and Prudent Energy) with the intention of identifying, siting, designing, installing, operating, and measuring energy storage systems with existing commercial PV systems at Target stores. This was to be a two-year research project; however numerous site, design, vendor, and installation issues were encountered along the way, resulting in revisions to the project scope and timeframe. The revised project included tasks to increase demand reduction, verify benefits of solar coupled with storage, and also assess the reliability and performance of two different storage technologies. Ice Energy and ZBB are the two storage manufacturers that participated in this demonstration project. The two main objectives were:

- Determine if the combined value of PV and energy storage is greater to the commercial customer and utility than either one alone.
- Assess storage capabilities, reliability and potential degradation of the technologies to assess lifetime characteristics. Kohl's in Redding, CA and the campus of the University of CA, San Diego provided the demonstration sites for this project.

Ice Energy Installation at Kohl's in Redding, California

This document provides a brief project description. For more detail on the project and the California Solar Initiative's (CSI) Research Development, Demonstration & Deployment (RD&D) Program, please visit calsolarresearch.ca.gov

The CSI RD&D Program is managed by Itron on behalf of the California Public Utilities Commission (CPUC).

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METHODOLOGY

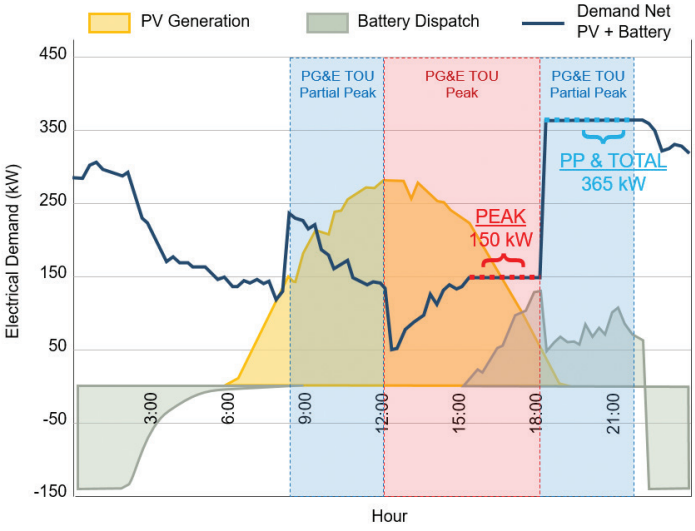
The SunPower team recruited Target to be the original host site for the demonstration. The team identified which storage technology would be hosted at each of the store sites. However, an agreement could not be reached as neither ZBB nor Prudent had prior commercial qualifications, and Target would not accept an experimental project without some promise of commercial benefit or indemnification. While the team looked for alternate host sites, one of the storage vendors (Prudent Energy) exited the project. Ultimately, the Ice Energy storage system was installed at a Kohl's store in Redding, California, where it was designed, permitted, installed, and monitored with no issues or delays. This demonstration consisted of three key activities:

- Assessing storage system operations, performance and reliability.
- Compare alternatives of deploying PV or ES separately.
- Measure the impact on electricity demand reduction, economic modeling and greenhouse gas reduction.

The ZBB storage system was redirected to the University of California, San Diego (UCSD) campus. While the system did go through the design, review, and permitting porcess, ZBB's equipment was severely damaged in route, rendering the entire system unusable. After significant delays, the equipment was repaired, reshipped, and installed on the UCSD campus. However, during commissioning, the ZBB equipment experienced a serious failure, was removed from the UCSD site, and shipped back to ZBB.

RESULTS AND OUTCOMES

The original goal of analyzing the performance of three unique energy storage systems integrated with existing, similarly-sized, commercial PV installations was not realized due to multiple siting and equipment issues. Of the several technologies originally pursued, only the Ice Energy storage system at Kohl's in Redding, CA was successfully commissioned and operated. For this technology, the economic analysis found that while the energy storage system could have a positive return for the customer, there was no particular synergy with solar generation. This was largely due to the high energy to power ratio of the particular technology. The Ice Energy system appears to be capable of delivering positive economics to a commercial customer on the PG&E E19S rate, with or without PV in place, assuming that 2015 CPUC Self-Generation Incentive Program incentive can be applied.



Conceptual Operation of Energy Storage in Parallel with Existing PV System

PUBLIC BENEFITS

The project encountered a number of challenges which resulted in valuable lessons learned by the SunPower team and project partners, the storage and solar community and the State of California.