GO solar CALIFORNIA

CSI RD&D PROGRAM

Cross-Cutting

Grantee:
University of California, Davis

CSI RD&D Funding:
$99,943

Match Funding:
$36,917

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2014-2015

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calsolarresearch.ca.gov/csi/122

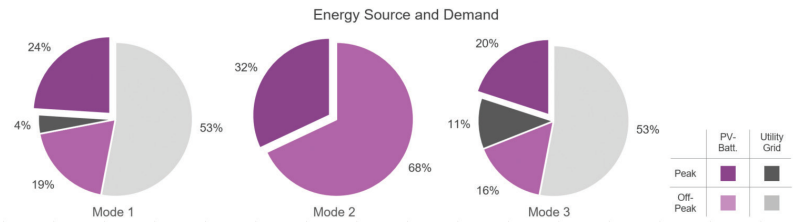
Itron | CSI RD&D PROGRAM MANAGER

Assessment of Smart Grid-tied Energy Storage Using Second-life Lithium Batteries

The addition of a photovoltaic (PV) array significantly changes the demand profile of a home. The greatest solar energy production occurs during the day, when electricity is cheapest and customer demand is often lowest. Without energy storage, this can result in a surplus of energy during off-peak hours but an undersupply during on-peak periods. The University of California, Davis (UCD) developed three separate control modes to optimize the flow of energy storage using second-life lithium ion batteries in order to maximize economic benefit and reduce grid dependency.

Mode 1 instructed the battery to utilize grid energy during off-peak hours while selling energy back to the grid during peak hours for maximum economic benefit. Mode 2 instructed the battery to meet the house demand with as little grid interaction as possible, resulting in nearly 100% renewable energy use but at the cost of increased battery degradation. Mode 3 optimized the use of solar energy to meet demand, charging the battery during the daytime and discharging to meet energy demand at night, resulting in less back-feeding to the grid but reduced grid interaction. Ideally, all three modes would be used and cycled for an optimal balance of savings, grid interaction, and battery longevity.

The study demonstrated that retired electric vehicle batteries can be re-purposed as stationary solar energy storage and demand side management, benefiting both the transportation and building energy sectors.



Energy source and demand corresponding to the system in modes 1, 2, and 3 (over four days' usage).

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).