GO solar CALIFORNIA

CSI RD&D PROGRAM

Grid Integration

Grantee:
Sacramento Municipal Utility District

Partners:
Hawaiian Electric Company, BEW Engineering, National Renewable Energy Laboratory, New Energy Options, Areva, Irradiance, Solar Consulting Services, Augustyn & Company, SynerGEE

CSI RD&D Funding:
$2,000,089

Match Funding:
$1,940,793

Project Timeframe:
2010-2013

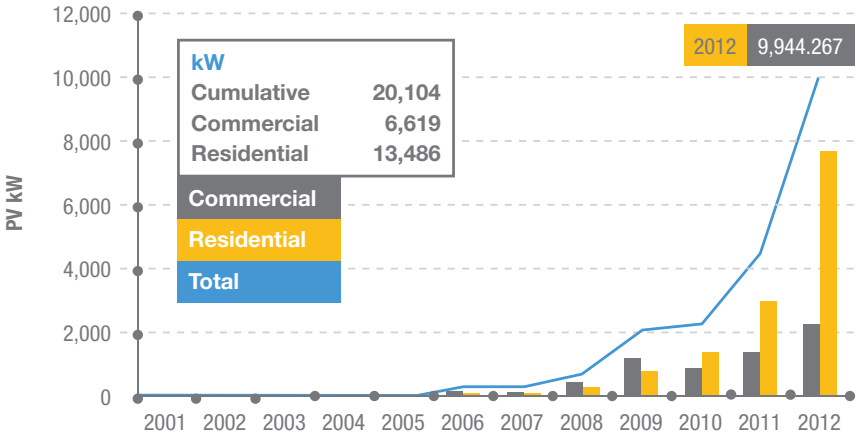
RD&D Project Portal:
calsolarresearch.ca.gov/csi/66

Itron | CSI RD&D PROGRAM MANAGER

High Penetration Photovoltaic Initiative

OVERVIEW AND OBJECTIVES

Utilities facing exponential growth in distributed solar lack the capabilities, tools and data to effectively plan and account for photovoltaic (PV) impacts on the electricity grid. The level of PV penetration often exceeds the 15% integration threshold and standards used in traditional utility practices for planning & operations. To address these barriers, the Sacramento Municipal Utility District (SMUD) in partnership with the Hawaiian Electric Company (HECO) conducted research to inform and pilot the development of visual tracking tools for understanding and communicating the bi-directional flow management of PV throughout the utility grid. A key research focus for this project was the development of a software visualization tool to identify high value locations for distributed PV in the distribution system, and to identify problem areas to enable high penetration PV. A key project objective included collaboration with other utilities and the transfer of lessons learned from this research.



Distributed Generation Growth in Hawaii

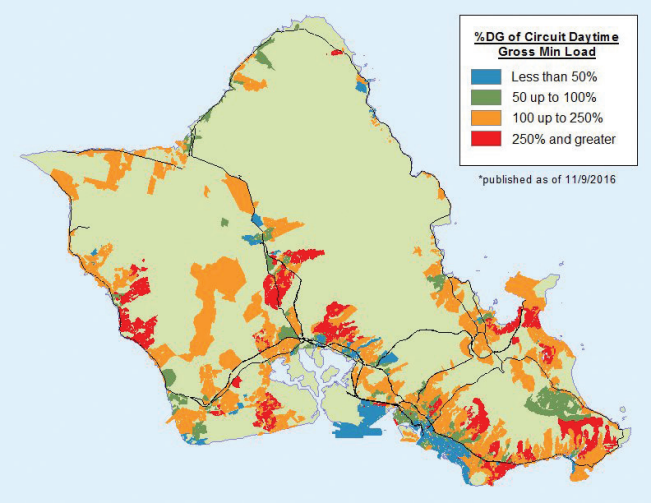
This document provides a brief project description. For more detail on the project and the California Solar Initiative's (CSI) Research Development, Demonstration & Deployment (RD&D) Program, please visit calsolarresearch.ca.gov

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

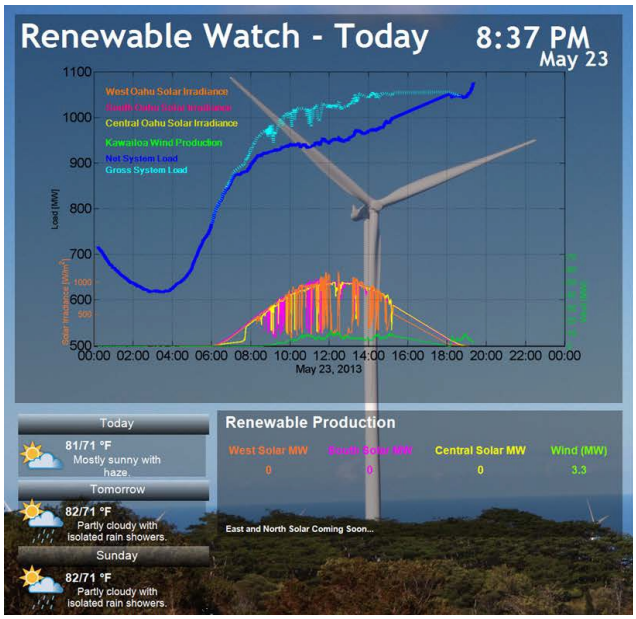
METHODOLOGY

The SMUD and HECO team conducted baseline feeder and system modeling as well as field monitoring and analysis on identified case studies that included sites and feeders within the SMUD and HECO utility service territories.

A software visualization tool was developed to enable identification of high value locations for distributed PV on the distribution system and to identify areas of constraint for high PV penetrations. The research team deployed an irradiance monitoring sensor network and coordinated advance communication for controls (i.e., dedicated cellular, advanced metering infrastructure (AMI) network, supervisory control and data acquisition (SCADA) system-enabled condition monitoring, and distribution remote terminal units (RTUs). Inverter monitoring via AMI communication from smart meter to inverter was also demonstrated. The tools were tested at residential, commercial and utility-scale deployments in California and Hawaii.



Oahu Locational Value Map showing installed PV compared to daytime minimum load



Renewable Watch: Seeing the Value of Renewables in Real-Time

RESULTS AND OUTCOMES

The outcome of this research was a software visualization tool which enables identification of high value locations for distributed PV on the distribution system and to identify problem areas requiring reinforcement or modification to enable high PV penetrations. Smart siting of renewable distributed generation involves fully understanding the solar resource, its potential deployment, and interaction with the existing distribution infrastructure. Case studies include residential, commercial, and undeveloped lots overlaid throughout the electrical system in order to assess interconnection benefits (cost and locational value) to the system. An additional outcome was a renewable generation operational tool that allows utilities to see how the renewable generation is functioning on their systems. This tool enables full use of distributed PV in displacing the need for distribution upgrades and natural gas peaking plants and allows validation of forecasting software, providing three hour-ahead and day-ahead PV output forecasts.

PUBLIC BENEFITS

- Provides advanced knowledge on addressing high penetration PV by two small yet progressive utilities that are currently seeing significant growth of distributed PV in their service territories.
- Makes available the software visualization tool and methodology developed by this project to other utilities coping with high penetration PV. The framework to optimize the location of PV systems within their service territories is a valuable outcome of this research.
- Jumpstarted lasting initiatives that are being adopted into SMUD and HECO processes and regulatory recommendations (interconnection standards, RSWG).
- Resulted in numerous technical presentations & papers throughout the research project period to inform market product development and industry standards development.