GO solar CALIFORNIA

CSI RD&D PROGRAM

Improved Technology

Grantee:
Solaria

Partners:
Pacific Gas & Electric

CSI RD&D Funding:
$1,092,428

Match Funding:
$1,338,013

Project Timeframe:
2010-2012

RD&D Project Portal:
calsolarresearch.ca.gov/csi/72

Proving Performance of the Lowest Cost Photovoltaic System

OVERVIEW AND OBJECTIVES

Concentrating photovoltaics (CPV) is a relatively new technology that provides for much higher efficiencies compared to traditional flat plate PV. This is both beneficial to reducing system costs with less cell material requirements as well as more energy production from a given area. However, the current marketplace lacks data on the reliability and long-term performance of such systems to allow for financing of CPV projects. Providing long-term performance data and information to establish the bankability and reliability of the technology will enable confidence in CPV in the distributed generation market. The goal of the Solaria project was to conduct detailed analysis and reporting on the performance of two CPV demonstrations to help convince investors and the financial community of the viability of this technology. The total system size installed at Solaria's manufacturing facility in Fremont, CA is 110 kilowatt peak. A second system, installed at Alameda County Santa Rita Jail in Dublin, CA has a total system size of 240 kWp. Solaria collected, analyzed, and reported on data and detailed system performance factors for these systems.

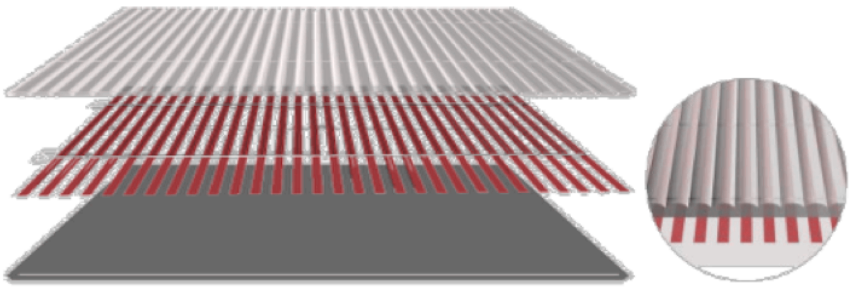


Illustration of low concentration concept using refraction from a patterned glass superstrate onto crystalline silicon cell strips connected in series and parallel underneath

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).

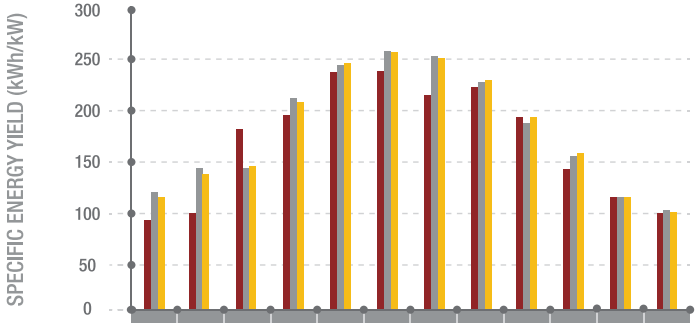
Itron | CSI RD&D PROGRAM MANAGER

METHODOLOGY

The Solaria team installed and monitored a 110 kWp photovoltaic (PV) tracking system at the Solaria manufacturing facility In Fremont, CA. The installation included two different tracking technologies, 52 kWp installed on azimuth tracking and 58 kWp on a single-axis horizontal tracking installation. This allowed for the comparison of Solaria's high performance technology across a range of industry applications and offered higher granularity of the Solaria module performance characteristics. In addition, the installation of Solaria modules on various tracking system types allowed for further cost and performance comparisons to validate the optimal tracker technology to use with Solaria modules.

The team also procured, installed, and interconnected a 240 kWp tracker installation at the Alameda County Santa Rita Jail in Dublin, CA. The Santa Rita Jail installation demonstrated how Solaria modules perform on a commercial tracker installation. The system uses two different tracker technologies: 220 kWp were installed on azimuth tracking and 20 kWp on a two-axis tracking installation. The use of two tracking technologies allowed for a side-by-side evaluation and helped build the case for Solaria modules across a variety of applications. Measuring actual system data across three different tracking system types and two sites, led to a better understanding of the technology and its associated risks.

Dual-axis tracking system at Santa Rita Jail



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Forecast Yield	93	103	181	198	236	239	214	221	193	143	115	100
Actual Yield	120	142	145	212	244	259	252	225	186	155	115	103
Expected Yield	118	137	146	207	246	258	250	227	193	156	115	101

Actual Vs. Forecasted Irradiance for Azimuth Tracking System in Fremont, CA

RESULTS AND OUTCOMES

One key aspect of the financial performance of an emerging energy technology is the ability to reliably predict the energy produced over time, and therefore, a project's cashflow. This research project demonstrated that the energy production of both sites was reliably predicted with performance indexes close to 100%, with the exception of the horizontal tracker in Fremont. These predictions were normalized for the actual conditions occurring at the site so a reasonable assumption is that over the duration of the project (typically 20 years); the project will produce an amount of energy very close to what was originally estimated. For the solar project investment community, this means that an investment in Solaria technologies produces known and calculated returns that can be relied upon. As a result of the data collected over the duration of this research project from the two test sites, Solaria has been able to initiate new projects on almost every continent, including, but not limited to, systems in the following countries: USA, Chile, France, Italy, India, China, and Qatar.

PUBLIC BENEFITS

- Helped overcome the primary obstacle to wide-scale deployment of CPV technology by providing investors and financial institutions with data on the actual performance of the technology.
- Published research data and results on CPV technology, which has led to a better understanding of the technology and project risks, and ultimately increased market penetration.
- Fully leveraged the materials, manufacturing processes, form factor, function, and field experience of the well-established crystalline silicon flat-plate PV industry.
- Was the first ground-mounted tracking system approved for construction in the City of Fremont in a residential location.
- Provided the foundation and necessary data for Solaria to finance new installations around the world.