

CSI RD&D Solaria Manufacturing Facility Installation Completion Report

Solaria Solar Electric Low-Concentration Solar Tracker

This project is supported with assistance from the California Solar Initiative (CSI) Research, Development, Demonstration, and Deployment (RD&D) Program. The purpose of this program is to help achieve the goal of creating a vibrant solar industry. This program makes investments to fund solar research and demonstration projects that will measurably reduce the cost and accelerate the installation of solar and other distributed technologies that could employ solar for generation, storage, or that could reduce the use of natural gas. This project's primary goal is to drive down the installed cost of solar.

Project Summary

Solaria, a California Corporation, has developed photovoltaic modules that use 50-67% less silicon than other silicon modules and are designed to not have compromises in performance or reliability. Solaria modules are the first flat plate PV module to use optical concentration and the first low-concentration module to receive UL and IEC certification. Solaria's module is optimized for large-scale commercial and utility tracking applications.

The goal of this CSI RD&D project is to perform detailed analysis and reporting on the performance of Solaria low-concentrating photovoltaic installations that incorporate innovations to reduce costs, increase reliability, and improve system production and efficiency. Solaria is using CSI RD&D funds to support installing and operating PV test systems to demonstrate that the technology is financeable. The project will also provide performance and reliability data of Solaria's products on different tracking systems totaling 350 kWpDC for two installations of which 240 kWpDC will be installed at Alameda County Santa Rita Jail located in Dublin, CA and 110 kWpDC will be installed at Solaria manufacturing facility located in Fremont, CA.

This report describes the installation of the 110kWp solar electric low-concentration solar tracking system at the Solaria manufacturing facility in Fremont, CA. This installation includes a 58 kWp single axis horizontal tracker system and a 52 kWp azimuth tracker system.



Solaria 110 kWp Manufacturing Facility Solar Electric Tracker Installation

Design & Permitting

The design and permitting phase was a learning experience for both Solaria and the City of Fremont as this was the first ground mounted tracker approved for construction by the City of Fremont in a residential location. Solaria and the City of Fremont worked together well during this process and Solaria is grateful for the City of Fremont's availability to work through the permitting process requirements. Residential landscaping requirements were an area that took extensive design resources to create a low cost solution while simultaneously meeting residential requirements. Again, the City of Fremont was very available to work with Solaria for an optimal landscaping design.



Perimeter Landscaping

Construction

Many challenges related to construction centered on building the project during the winter months. Constructing a project during the rainy and windy cold weather that persisted during the construction caused numerous delays to the schedule. The project took approximately 12 weeks to construct after permit approval whereas summer construction would normally take 6 weeks. Construction during the winter was necessary to provide the longest period of system performance data before the end of the grant term in December of 2013.



Winter Construction

The first phase of construction was to install the vibratory piers for the single axis horizontal tracker and the concrete encased foundations for the azimuth tracker systems. The foundations had to be designed for liquefaction zone in addition to abnormal city mud corrosiveness. These atypical requirements added more material and corrosion protection than a standard installation would.



Piers Supporting the Horizontal Axis Tracker System



Preparation to Install Concrete Foundation for Azimuth Tracker

After the foundations were complete trenching for the electrical conduit and monitoring equipment took place. This trenching buries the conduit that protects the wiring between the panels and the inverters in addition to the wiring runs between inverters and the point of interconnection.



Electrical Conduit

After the foundations and conduit trenching were complete the steel erection of the tracker commenced. This proceeded rapidly due to the modular nature of the azimuth tracker.



Azimuth Tracker Steel Erection

After the steel erection was complete the Solaria modules and rails were fastened to the tracking systems.



Solaria Module Installation

After the Solaria modules were mounted and the trenches for conduit were completed the electrical and inverter installations took place.



Inverter, Data Monitoring & Electrical Installation

System Commissioning

After the project was operational and substantially complete Solaria hired 3rd party companies to perform system commissioning which included a thorough system inspection and calibration. Detailed results from this commissioning and inspection efforts are contained in the report entitled 'Solaria Manufacturing Facility System Commissioning Report'.

Marketing

The completion of the project in spring allowed Solaria to hold a grand opening event on Earth Day 2011 that obtained the interests of many media outlets such as ABC, Mercury and others. Refer to Exhibit A for the complete Solaria news release.

Conclusions

This project took somewhat longer than expected due to the winter construction schedule necessary to meet the project objective of providing as much data as possible before the end of the grant term in December of 2012. This system will provide valuable data beyond the term of the grant and has already helped to drive the wider adoption of low-concentration PV technology.

The additional landscaping requirements for installation in a residential area drove some additional costs and delays for the project. These additional costs and permitting delays should be accounted for when planning for tracking system installations in residential areas, especially in jurisdictions without experience in tracking PV systems.



Additionally, this first large scale installation of Solaria's low-concentration PV technology provided valuable experience in optimizing installation techniques. The project allowed Solaria to develop an optimized module rail and module mounting hardware. In addition, the tracker construction and module installation process was a valuable learning process for future projects to set up construction in the most efficient and cost effective manner possible. Although these optimizations are critical to future cost reductions, the combination of these learning's during construction, weather delays, and additional permitting and landscaping costs mean the costs for this install are not representative of future installs and therefore will not be reported.



Exhibit A - News Event Summary



Lt. Governor Newsom, EPA Regional Director Blumenfeld, and Other California State and Federal Officials Dedicate Solaria Corporation Headquarters and Solar Manufacturing Plant

Earth Day Dedication of New Solaria Facility Reinforces California Leadership in Solar Technology

FREMONT, CA, APRIL 22, 2011 — Today Lt. California Governor Gavin Newsom and EPA Regional Administrator Jared Blumenfeld presided over the dedication of Solaria Corporation's solar power manufacturing plant and solar array at the company's global headquarters in Fremont, CA.

They were joined by several Federal and California officials, including CPUC Commissioner Mark Ferron and CEC Commissioner Karen Douglas. During this Earth Day solar dedication, officials highlighted the importance of public-private partnerships that have made California a worldwide leader in solar technology and are bringing manufacturing jobs back to California.

"Solaria solar panels incorporate innovative technology that delivers attractive project economics while leveraging crystalline silicon reliability, efficiency, and supply chain," said Solaria CEO Dan Shugar. "The modules feature industry standard materials, and have been deployed and successfully financed in projects in the U.S., Asia, and Europe. Solar has now emerged as both the environmentally and economically preferred method of generating peak power for customers – and many of the industry innovations are born here in California."

"California has been instrumental in implementing incentives that help foster the growth of solar and other green technologies. Solaria is an exemplar of clean tech job growth in California — the kind of growth that can be furthered through effective public-private partnerships," said Lt. Governor Newsom. "Developing and attracting new manufacturing facilities and jobs to our state is my top priority as we work to reinvigorate job growth and retention."

"Solaria's new manufacturing facility and solar array align well with this Administration's focus on securing America's energy independence while reducing harmful air emissions," said Jared Blumenfeld, EPA's Regional Administrator for the Pacific Southwest. "This new advanced solar technology proves that we can spur U.S. manufacturing, create new jobs, and propel our nation's leadership in renewable energy."

Headquartered in California, Solaria designs, manufactures and markets silicon PV modules and systems to solar system integrators, project developers and electric utilities. Based on its patented low-cost cell multiplication technology, Solaria's modules provide reliable performance while matching the form, fit and performance of conventional PV modules. The company has expanded its global capacity to 50 MW, and plans significant expansion next year.

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