May 21, 2012

Docket No. 12-IEP-1D

In the matter of,
2012 Integrated Energy Policy Report Update (2012 IEPR Update)

WORKSHOP
RE: Interconnection of Renewable Development in California

Itron, serving as Program Manager for the CPUC's California Solar Initiative, Research, Demonstration and Deployment Program (CSI RD&D) is pleased to submit comments to the California Energy Commission's 2012 Integrated Energy Policy Report Update.

The CSI RD&D Program began in 2008 and seeks to help build a sustainable and self-supporting industry for customer-sited solar in California. To achieve this, the California Legislature authorized the California Public Utilities Commission (CPUC) to allocate $50 million of the CSI budget to an RD&D program.

The agenda for the May 14, 2012 IEPR workshop on Interconnection of Renewable Development in California notes that discussion will include near term approaches, tools and methods to address interconnection challenges. These comments are being submitted in the spirit of sharing the research and findings from CSI RD&D to support and help inform the CEC's IEPR process and report.

One of the key focus areas for the CSI RD&D program is integration of PV into the utility grid. Solar resource and utility planning models provide utilities with the ability to identify optimal locations for high penetration PV. It will become even more important in the future for utility grid operators to have these planning, operations and modeling tools to accurately forecast and assess PV generation. To date, CSI RD&D has funded six research projects that support planning and modeling for high penetration PV. Details of these six research projects can be found in Attachment 1. All of the products and deliverables from these projects are posted to the CSI RD&D program website (www.calsolarresearch.ca.gov) and distributed as widely as possible.

On March 8, 2012, the CPUC adopted RESOLUTION E-4470 (http://docs.cpuc.ca.gov/PUBLISHED/COMMENT_RESOLUTION/158790.htm) which provided grant funding to five additional projects focused on grid integration of PV. Attachment 2 provides the grantee, project title and funding level of these new projects. Currently the CSI RD&D Program is working with each of these grantees on statements of

work and budgets for inclusion into a grant agreement, with the work anticipated to begin in Summer of 2012. Two projects (one with G.E and one with EPRI) are particularly relevant to the focus area of this workshop. Both the G.E. and EPRI projects address utility interconnection of PV and research that supports assessing and streamlining the interconnection process. The project with G.E. will quantify the risks of unintended islanding and use this work as a basis to simplify PG&E's interconnection requirements. The EPRI project has a much broader focus and seeks to develop a methodology that will allow utilities in California to more quickly screen new interconnection applications and accept new PV projects without the risk of negatively impacting the grid. All investor-owned utilities in California along with SMUD are partners in this project. Both the GE and EPRI projects will help inform CPUC decision-making regarding interconnection and operating requirements related to anti-islanding operations of PV inverters (Rule 21). The scopes of work and budgets for these projects are being further defined with work anticipated to begin during Summary 2012. More details about these projects can be found in Attachment 3.

We appreciate the opportunity to provide comments to the 2012 IEPR Update and look forward to continued collaboration with the CEC. Please let me know if you have any questions or would like additional information.

Sincerely,

Ann Peterson
Itron
CSI RD&D Program Manager

CSI RD&D Program

Grid Integration: High Penetration PV

Planning and Modeling for High Penetration PV

Distributed PV systems are outside the scope of most utility planners and engineers, due to their small size and historically low market-penetration and utility personnel may not be familiar with the operational characteristics of these systems. In addition, due to the rapid growth in distributed PV systems, utility grid operation models and planning tools lack the ability to account for distributed PV generation technologies and resources. Problems also exist with the current methods for estimating solar resources and predicting PV system output. Existing solar resource models are based on lower resolution insolation data sets and usually provide only hourly resource values. Only with the emergence of higher concentrations of PV onto distribution feeders has there been a recognition that rapid changes in atmospheric conditions over relatively small areas can have significant impacts on the aggregated PV system output and on the associated electricity distribution system.

Existing methods for predicting and planning for high penetration PV limit the ability of utilities to strategically locate this technology within their T&D systems. New solar resource and utility planning models provide utilities with the means to identify optimal locations for high penetration levels of PV. As PV and other DG resources form a larger portion of the electricity generation mix, it will be increasingly important to have electric system planning, design, and operation modeling tools that provide utilities and others in the solar industry, with the ability to accurately assess and forecast energy output and account for distributed PV systems.

Development and Analysis of a Progressively Smarter Distribution System

University of California Irvine
Advanced Power and Energy Program

Partner: PG&E

The goals of the University of California, Irvine (UCI) project are to utilize modeling and simulation to quantify PV integration limitations on distribution circuits and to develop and evaluate progressively smarter distribution systems which can accommodate higher levels of PV. Monitored field data will be used to develop and verify distribution circuit models and PV integration limits will be quantified for these circuits. The project will also evaluate advanced inverters, control strategies, standards, hardware, and communications to enable and support increased PV penetration on the distribution system. Results from the project will be used to inform advanced standards.

Advanced Modeling and Verification for High Penetration PV

Clean Power Research

Partners: NREL, SUNY, NYSERDA, LIPA, SMUD, NYPA, SEPA, SRP

Clean Power Research has developed a free solar resource model (www.ca.solaranywhere.com) that provides high temporal and spatial resolution data for use in forecasting and planning tools. The team is integrating PV modeling capabilities with an open-source distribution engineering and analysis tool and creating a PV value assessment tool which will enable utilities to select and target the best locations for PV. These tools and data streams will be made publicly available for use by installers, manufacturers, utilities and others engaged in the transformation of the electric power grid into a clean energy marketplace.

Planning and Modeling for High Penetration

SunPower Corp.

Partners: AWS Truepower, Sandia National Lab, KEMA, CAISO

The SunPower team will produce an improved solar resource model with temporal resolution ranging from 10 minutes to 1 second and spatial resolution going to below 4 km2. Results of the higher solar resolution data will be validated against PV systems monitored by SunPower in California. The emphasis of this project is to produce the tools and resources necessary to facilitate the study of high penetration PV scenarios in California using industry-standard simulation tools. This project will provide critical information to utility and grid operation planners about solar resource variation and PV behavior under both stable and variable conditions.

Improving Economics of Solar Power through Resource Analysis, Forecasting and Dynamic System Modeling

University of California, San Diego

Partners: EPRI, EDSA Power Analytics, CAISO, SDG&E

The University of California, San Diego project focuses on providing utilities and the solar industry with electricity system planning, design and operation modeling tools for accurately assessing and forecasting energy output from distributed PV systems. A one-year dataset of solar irradiances will be generated at 1 km resolution which will inform solar resource maps as well as to forecast PV power output throughout California up to 6 hours ahead. These high resolution (both temporal and spatial) resource maps and modeling tools will be a critical component in addressing high penetration PV.

CSI RD&D Program

Grid Integration: High Penetration PV

Testing and Development of Hardware and Software for High Penetration PV

Successful grid integration of high-penetration PV requires robust grid, PV communications, control systems, and operational procedures. PV systems will need to be capable of dynamically interacting with varying frequency and voltage conditions on the grid including load and VAR (reactive power) control to improve reliability. New software and hardware tools will emerge in response to these needs. Field testing, and demonstrations are needed before these new tools can realize widespread market adoption.

Analysis of High-Penetration Levels of PV into the Distribution Grid in California

Southern California Edison/NREL

Partners: NREL, Satcon, CPR, Electrical Distribution Design

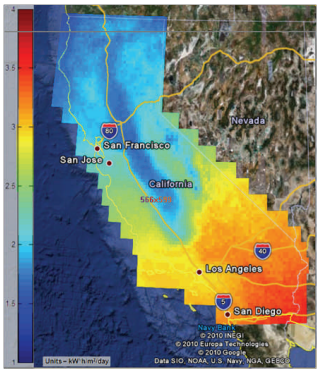
This project focuses on accelerating the placement of high levels of PV penetration into the existing distribution circuits and identifying new circuit configurations that will help increase penetration levels of PV. For the first year of this project, the SCE team will conduct modeling, simulations, and testing of possible advanced hardware and software solutions. Laboratory testing will be conducted on advanced inverters and control systems, and these advanced systems will be installed in projects in the Southern California Edison territory. During the second year, the team will evaluate the advanced technologies that were developed during the first year of the project.

High Penetration PV Initiative

Sacramento Municipal Utility District

Partners: HECO, NREL, SunPower Corp., New Energy Options, Areva, Irradiance and other consulting firms

SMUD, in partnership with Hawaiian Electric Company (HECO) will demonstrate new hardware and software tools that provide communication and management between PV systems and utility controls using advanced metering infrastructure (AMI). The team will develop a software visualization tool that enables identification of high value locations for distributed PV. The tools developed through this project will be tested and validated at residential, commercial, and utility-scale deployments in California and Hawaii. The project will provide utilities the with tools to integrate increased levels of PV into the grid.



GO solar CALIFORNIA

LEARN MORE:

One stop for all solar in California: *GoSolarCalifornia.ca.gov*

CSI RD&D website: *CalSolarResearch.ca.gov*

PROGRAM CONTACTS:

Neal Reardon (Neal.Reardon@cpuc.ca.gov)

Ann Peterson (Ann.Peterson@itron.com)

Itron CSI RD&D Program Manager

Attachment 2: Grid Integration Projects receiving CSI RD&D Funding Awards from Solicitation #3

Project ID	Project Title	Applicant	Requested Funding	Recommended Funding (up to)	Match Funding Provided
327	Quantification of Risk of Unintended Islanding and Re-assessment of Interconnection Requirements in High-Penetration of Customer-Sited Distributed PV Generation	General Electric International, Inc. Energy Consulting	$629,100	$629,100	$632,700
316	Screening Distribution Feeders: Alternatives to the 15% Rule	Electric Power Research Institute, Inc.	$1,978,239	$1,978,239	$1,978,239
322	Tools Development for Grid Integration of High PV Penetration	BEW Engineering	$2,000,000	$964,500	$1,077,100
307	Integrating PV into Utility Planning and Operation Tools	Clean Power Research	$999,351	$852,260	$875,000
314	High-Fidelity Solar Forecasting Demonstration for Grid Integration	U.C. San Diego	$1,548,148	$1,548,148	$1,548,148

Attachment 3: CSI RD&D Interconnection Projects

Screening Distribution Feeders: Alternatives to the 15% Rule

Grantee: EPRI (in partnership with NREL, Sandia, PG&E, SCE, SMUD, and SDG&E)

The main goal of this research is to provide utilities in California with useable and accurate ways to determine the available capacity (hosting capacity) for PV generation in existing distribution feeders. This hosting calculation method could potentially allow California utilities to more quickly screen new applications. Decisions could be made considering the feeder characteristics and existing conditions instead of applying a generic 15% criterion.

The proposed research will begin around June 2012 and conclude after 24 months. The work will include but is not limited to the following:

- Investigating and documenting current practices for screening PV interconnection requests among California utilities.
- Defining a range of feeder types, loadings, PV and electrical characteristics in California and creating a control group with key parameters.
- Developing detailed distribution feeder models and collecting high-resolution solar data for performing high-penetration PV analysis.
- Performing a high-penetration assessment of the test feeders to determine each specific feeder's hosting capacity for solar PV.
- Developing a practical screening criterion for evaluating new interconnection requests.

Key deliverables expected from this research include:

- A report on current utility PV interconnection screening practices
- A database of select feeder characteristics in California
- One-second resolution from selected PV monitoring equipment
- A report on proposed screening criterion for new interconnection requests.

Quantification of Risk of Unintended Islanding and Re-Assessment of Interconnection Requirements in High Penetration of Customer-Sited Distributed PV Generation

Grantee: G.E. (in partnership with PG&E)

The main goal of this research is to quantify the risks of unintended islanding in distribution circuits with high penetration of customer-sited distributed PV generation and, based on the insights from that work, review and simplify PG&E's interconnection requirements relative to islanding concerns.

The proposed research will begin around June 2012 and conclude after 24 months. The work will include but is not limited to the following:

- Employing statistical analysis of both solar and feeder load data to define the probability that the aggregate PV power output on a feeder with high PV penetration is within a defined tolerance of the contemporaneous load demand.
- Testing the aggregate transient behavior of inverters from various manufacturers during situations where the inverters are islanded along with feeder loads of various characteristics.
- Determining the duration of islanded operation and the characteristics of the voltages that are produced during this islanded state.