

## Proposed Agreement between California Energy Commission and Clean Power Research

**Title:** Demonstration and validation of PV output variability modeling approach  
**Amount:** \$450,000.00  
**Term:** 26 months  
**Contact:** Zhiqin (Jessica) Zhang  
**Committee Meeting:** 3/16/2011

### Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Electric	Renewables	Utility-Scale Renewables	\$4,800,000	\$450,000	\$0	0%

### Recommendation

Approve this agreement with Clean Power Research for \$450,000.00. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

### Issue

According to Governor Jerry Brown's new energy plan, by 2020, California should produce 20,000 new megawatts (MW) of renewable electricity. Furthermore the Governor calls for the Legislature to codify a requirement that 33% of the state's electricity be derived from renewable sources. This step builds upon Governor Arnold Schwarzenegger's Executive Order S-14-08 that directed state government agencies to take actions to help achieve California's Renewable Portfolio Standard (RPS) goal, which requires electricity retail sellers to serve 33 percent of their load with renewable energy by 2020.

Governor Brown's energy plan builds even further upon these goals, adding the additional goal of 12,000 megawatts of Localized Electricity Generation; 8,000 Megawatts of Large Scale Renewables; and increasing combined heat and power production by 6,500 megawatts. Localized energy is onsite or small energy systems located close to where energy is consumed that can be constructed quickly (without new transmission lines) and typically with relatively low environmental impact. Combined heat and power projects (also known as cogeneration) use the excess heat or electricity generated by power plants or industrial facilities and are much more efficient than traditional power plants and many industrial plants.

Solar development and particularly utility scale solar development is a crucial part of achieving these various goals in Governor Brown's energy plan. The California Public Utilities Commission (CPUC) suggests that the technology mix, for the baseline scenario to reach 33 percent by 2020, will primarily rely on wind, solar thermal, geothermal, solar photovoltaics (PV) (at generation of 44 percent, 24 percent, 15 percent, 9 percent respectively) and the rest from low levels of biomass, biogas and small hydro (generation of 4 percent, 3 percent and <1 percent respectively).

One of the critical challenges to greater penetration of utility-scale renewable energy into the state's electricity system is the variability associated with solar photovoltaic (PV) plants. The California Public Utilities Commission (CPUC) and other industry experts suggest that the baseline Renewable Portfolio Standard (RPS) scenario of 33 percent by 2020 will require nearly 24 GW of new renewables, including at least 5 GW of PV. Such a large increase in PV supply will require that the control area operators in the state-most importantly the California Independent System Operator (CAISO) - have the tools at hand required to accept this energy onto the grid and maintain existing standards of reliability. Clean Power Research (CPR) has developed a unique methodology that uses satellite-derived solar data to forecast PV fleet output and quantify variability given the design attributes and locations of PV systems. The methodology uses advanced algorithms to track cloud patterns and calculated plant correlation coefficients. CAISO sees potential of using the approach directly or indirectly to calibrate its studies of system operations under alternative renewable energy scenarios. However, before the methodology will be practical and usable in studies by the CAISO and other parties, and can begin to inform planning for future operational needs, additional work is needed in data analysis, validation, and system integration.

## **Background**

On November 2, 2010 the California Energy Commission (Energy Commission) PIER Renewable Program released a Request for Proposals (RFP) for research needs of utility-scale renewable energy. The RFP announced that up to \$7.3 million was available from the PIER Program to fund initiatives that will help meet research, development and demonstration (RD&D) needs related to more rapid and environmentally responsible deployment of Utility-Scale Renewable Energy (USRE) to the California electricity grid. The goal of the RFP was to support increased market penetration of multiple renewable energy technologies; reduction of impacts on land use, water consumption, and ecosystem resources; and mitigation of technical and economic barriers to the increased injection of non-baseload renewable energy sources into the transmission system.

Outreach to expand awareness of the RFP included pre-proposal workshops on November 9, 2010 held in the Energy Commission's Hearing Room A, in Sacramento, California and on November 16, 2010 held in the George T. Booker Conference Room in the University of California San Diego. The workshop covered in detail the application process, and provided a forum for questions and answers. The workshops, RFP, and questions and answers were advertised and published on the Energy Commission website.

On the proposal due date of December 21, 2010, the Energy Commission received 28 proposals. In accordance with the 2010 RFP Package, each proposal was screened for completeness, and reviewed by Energy Commission staff. Nine proposals were rejected from the administrative screening process. The Technical Advisory Committee reviewed, evaluated, and scored the proposals using the criteria prescribed in the Application Package.

## **Proposed Work**

This project will demonstrate and validate the CPR-developed methodology and PV variability research in collaboration with the CAISO, the primary grid operator of the state, in order to (1) measure the accuracy of the models for PV sources within the CAISO control area and (2) ensure that the data is delivered in a manner compatible with the existing energy and reserve market mechanisms. In order to achieve this, the project will:

- expand an existing PV system technical database to capture 100% of the state's grid-connected PV resources
- run the model using a new high-resolution solar irradiance satellite data set
- generate time series data to demonstrate compatibility and smooth integration into CAISO systems
- validate the model for PV systems using CAISO's set of measured high-speed plant data

### **Justification and Goals**

This project "[will develop, and help bring to market] advanced electricity technologies that reduce or eliminate consumption of water or other finite resources, increase use of renewable energy resources, or improve transmission or distribution of electricity generated from renewable energy resources" (Public Resources Code 25620.1.(b)(4)), (Chapter 512, Statutes of 2006)).

This will be accomplished by:

- enabling accurate production forecasts of California's PV resource fleet and quantify its variability necessary for grid planning and operation
- demonstrating and validating specific methodology and PV variability research results