Proposed Agreement between California Energy Commission and Satcon Technology Corporation

Title: Grid-interactive photovoltaic system with DC-link battery storage integration
Amount: $1,994,509.00
Term: 38 months
Contact: John Hingtgen
Committee Meeting: 3/16/2011

Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Electric	Renewables	Utility-Scale Renewables	$4,800,000	$1,994,509	$0	0%

Recommendation

Approve this agreement with Satcom Technology Corp for $1,994,509.00. 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).

As such, utility and power conversion industries are preparing for the grid-integration challenges of increasing renewable sources, such as the effects of sudden or significant fluctuations in photovoltaic

(PV) system output power. The intermittency and load challenges can cause utility feeder voltage variations outside of voltage standards or discernible flicker in illuminating devices at customer sites. This voltage variation problem can be addressed with two distinct approaches: through fast reactive power generated by inverter or through fast real power drawn from an energy storage device. For large voltage variations, a combination of reactive power generation and a storage device may be required. Due to high cost of storage, very few renewable installations have been integrated with storage system. Furthermore, there is insufficient targeted research and development on the applications most likely to benefit from a PV-storage system, such as peak shaving, load shifting, demand response, and outage protection, and on developing PV-storage system specifically designed to meet those needs.

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

The goal of this project is to demonstrate how high bandwidth automatic voltage control can be applied to mitigate intermittency in power plant output and load induced voltage variations on the utility feeder. It also aims to develop electric energy storage components and a system specifically designed and optimized for grid-tied PV applications. To achieve these goals, the project will demonstrate a hybrid electric generation system comprised of a 500 kW PV array, 500 kW grid-connected PV inverter, and integration of 500 kWh state-of-the-art battery technology, to further enable utility-scale renewable energy sources. The 500 kW system is a standard building block for multi-megawatt configurations and scalable to target a utility scale plant of 10 MW. The combined inverter and battery storage system will help mitigate the destabilizing effects of intermittency, thereby supplementing the load demand and limiting output power ramp rates to levels that are compatible with other utility generation resources. The demonstration of advanced inverter and integrated solar PV storage system will be part of the Sacramento Municipal Utility District's solar highway project.

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, Statues of 2006)).

This will be accomplished by:

- developing electric energy storage components and system specifically designed and optimized for grid-tied PV applications
- demonstrating a hybrid electric generation system comprised of a 500 kW PV array, 500 kW grid-connected PV inverter, and integration of 500 kWh state-of-the-art battery technology