NREL teams with SolarCity to maximize solar power on electrical grids

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The Energy Department's National Renewable Energy Laboratory (NREL) and SolarCity have entered into a cooperative research agreement to address the operational issues associated with large amounts of distributed solar energy on electrical grids. The work includes collaboration with the Hawaiian Electric Companies to analyze high penetration solar scenarios using advanced modeling and inverter testing at the Energy Systems Integration Facility (ESIF). The project is funded in part through an Energy Department solar cost-share program.

The ESIF on NREL's Golden, Colorado campus, houses a broad array of capabilities and laboratories focused on energy integration research including megawatt-scale power hardware-in-the-loop testing, which will allow researchers to analyze the behavior of distributed electricity generation and distribution devices while connected to a testing system that dynamically emulates the characteristics of a power system. Testing with SolarCity and Hawaiian Electric at ESIF will cover the dynamics between inverter-based assets on a grid system, voltage regulation, and bi-directional power flows. Scientists and engineers from SolarCity and Hawaiian Electric were at NREL in September to kick off the research project and in October for a follow-up meeting.

NREL has completed load rejection over voltage (LRO) testing and will be completing ground fault overvoltage testing shortly. This testing will allow Hawaiian Electric to approve photovoltaic (PV) deployments to customers who have been waiting for interconnection on these high penetration solar circuits.

"This is an excellent opportunity to utilize ESIF's unique power hardware-in-the-loop capability with inverter-based assets," NREL Director of Partnerships for Energy Systems Integration Martha Symko-Davies said. "This capability will be used to help utilities evaluate the impact of distributed energy resources like solar technologies on distribution systems and help them find solutions to utilizing these technologies in a safe, reliable, and cost-effective manner at scale."

NREL will also evaluate SolarCity's PV generation curtailment hardware and software based on the potential need for PV power curtailment, or the use of less solar power than is available at a specific time, through a remote signal.

Hawaiian Electric is partnering with NREL and SolarCity throughout the process, providing technical input on testing and setup, as well feedback on results.

"SolarCity is committed to ensuring that solar is an asset to grid operators, and this partnership will take us further towards that goal," SolarCity Chief Technology Officer Peter Rive said.

"We know how important the option of solar is for our customers. Solving these issues takes everyone-utilities, the solar industry and other leading technical experts like NREL-working together. That's what this work is all about," Hawaiian Electric Vice President for Energy Delivery Colton Ching said. "With the highest amount of solar in the nation, our utilities are facing potential reliability and safety issues before anywhere else."

Provided by National Renewable Energy Laboratory