NREL
NATIONAL RENEWABLE ENERGY LABORATORY

ENERGY SYSTEMS INTEGRATION

ESI optimizes the design and performance of electrical, thermal, fuel, and water pathways at all scales.

PARTNERSHIPS

NREL + CSIRO

The Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's science agency, has teamed up with NREL to evaluate advanced control solutions for integrating solar energy in hybrid distributed generation applications. NREL and CSIRO demonstrated a plug-and-play microgrid controller at the ESIF and also tested other control techniques for integrating solar power with Australian and U.S. electrical distribution systems.

R&D STRATEGY

NREL prepared a 250-kW microgrid, including a diesel generator, a solar photovoltaic (PV) inverter, a controllable load, and a grid simulator, and used it to evaluate a CSIRO-supplied plug-and-play microgrid controller. The distributed control system uses local controllers at each generator and controllable load in the system, as well as solar forecasting technology, to maximize the use of solar energy while limiting the ramp rates of other generation sources, such as diesel generators.

NREL and CSIRO also demonstrated additional control techniques in a joint experiment that leveraged hardware at NREL's ESIF and CSIRO's Renewable Energy Integration Facility. The team employed power hardware-in-the-loop capabilities to connect hardware at both locations to software-modeled electric distribution systems in a single real-time simulation.

IMPACT

This effort aims to develop an advanced solar microgrid controller that automatically recognizes and optimizes new solar power sources. NREL's work with CSIRO is supporting a broader Australian project to simplify the integration of PV power systems by creating plug-and-play technology for interconnection to the grid. The work seeks to accelerate the deployment of PV systems while lowering their cost.

This project received funding from the Australian Renewable Energy Agency (ARENA).

CSIRO's Daniel Rowe (left) works with NREL engineers Mariko Shirazi and Blake Lundstrom to perform microgrid controller testing in the ESIF's Power Systems Integration Laboratory. *Photo by Dennis Schroeder, NREL 31611*

Partner with NREL at the ESIF

User facility access to the ESIF is awarded through the review and approval of user proposals, depending on the scientific merit, suitability of the user facilities, and the appropriateness of the work to DOE objectives, and includes a signed user agreement for the facility.

For more information, please visit:
www.nrel.gov/esi/working_with.html
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The Energy Systems Integration Facility (ESIF) at the National Renewable Energy Laboratory (NREL) provides the R&D capabilities needed for private industry, academia, government, and public entities to collaborate on utility-scale solutions for integrating renewable energy and other efficiency technologies into our energy systems.

To learn more about the ESIF, visit: ***www.nrel.gov/esif***.

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