NREL is collaborating with San Diego Gas & Electric Company (SDG&E) to model a microgrid that the utility is expanding in Borrego Springs, California. Microgrids are small, self-powered electric grids that can operate independently or can be connected to the larger grid. NREL is evaluating how a microgrid controller with advanced functionality would perform for the Borrego Springs microgrid.

R&D STRATEGY
NREL is constructing a scaled model of the Borrego Springs microgrid by employing power and controller hardware to represent the microgrid’s large amount of distributed energy resources—including a large PV plant, energy storage systems, and diesel generators—while other circuit components are virtually represented in a model executing on real-time digital simulators (RTDS). NREL is then interfacing an actual microgrid controller similar to the one used at Borrego Springs to the power hardware and to the virtual components modeled on the RTDS to test the system’s performance, particularly with regard to disconnection and reconnection of the microgrid to the utility.

NREL is also running this model of the Borrego Springs microgrid on a combination of the ESIF’s RTDS and those at SDG&E’s Integrated Test Facility, via a remote connection. Again, power hardware is representing some components on the NREL side, and the actual microgrid controller is interfaced to the power hardware and the model. This will allow SDG&E to use NREL’s power hardware capabilities remotely, although it is not able to represent fast dynamics across the entire microgrid because of the communications delay.

IMPACT
Microgrids can create a more resilient electric grid by disconnecting from the main grid during disturbances, such as outages, and continuing to operate independently. They may also need to operate with high penetrations of renewable generation in addition to traditional distributed energy resources. NREL’s work can confirm the performance of a microgrid before it is actually deployed.