OBJECTIVE AND SIGNIFICANCE: The project objective is to foster international collaboration around smart grids, particularly distribution systems and microgrids with solar photovoltaics (PV) and energy storage. The Hawai‘i Natural Energy Institute (HNEI) at the University of Hawai‘i is among an esteemed group of U.S. institutions including Washington State University (WSU), Massachusetts Institute of Technology (MIT), Texas A&M University, General Electric, ABB, and several U.S. Department of Energy national laboratories, as well as peer organizations in India including five Indian Institute of Technology (IIT) campuses. This project is an important opportunity to highlight Hawai‘i’s challenges and solutions at the forefront of renewable energy integration, while inviting input from international leaders in smart grid research and technology development.

BACKGROUND: HNEI’s work, conducted by its GridSTART team addresses the following objectives within the larger project:

- To provide models and data from distribution circuits with high distributed PV penetration as a basis to explore advanced devices, controls, and distribution system operation (See Figure 1);
- To operate these models on HNEI’s hardware-in-the-loop (HIL) equipment linked in real time to devices and controls at, for instance, WSU and the National Renewable Energy Laboratory (NREL) as a means to provide realistic testing in a controlled environment;
- To provide live updates of multi-horizon PV forecasts (Appendix B5) from HNEI’s solar forecasting system alongside real PV measurements to support third-party applications including distribution grid operations and optimal energy storage control; and
- To provide outreach and workforce development addressing smart grid technologies and applications and grid integration of renewable energy.

PROJECT STATUS/RESULTS: As of year three of the six year project, UH researchers and postdoctoral fellows have:

- Co-authored two papers and an extended abstract;
- Hosted two professors from IIT for a U.S.-India Partnership to Advance Clean Energy (PACE) fellowship;
- Presented webinars and prepared an exhibit attended by approximately 1,000 Hawai‘i K-12 students (Figure 2); and
- Advised two high school students on research projects related to the variability of PV generation.

Figure 1. Overview of HNEI’s data and models from the area of South Kīhei, Maui.

Figure 2. Poster and interactive display presented to K-12 students at the 2019 SOEST Open House at UH Mānoa.

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