



Hawai'i Natural Energy Institute Research Highlights

International Support

Provincial Electricity Authority of Thailand (PEA) Collaboration

OBJECTIVE AND SIGNIFICANCE: With funding from the U.S. Office of Naval Research (ONR) under the Asia-Pacific Regional Energy Systems Assessment (APRESA) grant, HNEI's Grid System Technologies Advanced Research Team (GridSTART) is providing capacity building and technical support to Provincial Electricity Authority of Thailand (PEA). As Thailand's primary distribution grid operator serving 74 of 77 provinces, PEA is advancing renewable energy integration through various initiatives. HNEI GridSTART developed a capacity building program focused on renewable energy grid integration, smart grid technologies, microgrid assessment and design, and development of advanced electric vehicle (EV) charging applications. Beyond training programs, HNEI's support extends to technical assistance for PEA's microgrid development, particularly the commissioning of a microgrid on Koh Phaluai island in the Gulf of Thailand.

OpenDSS and OpenDSSdirect

OpenDSS is an open-source program. OpenDSS is an electric power distribution system simulator (DSS) designed to support distributed energy resource (DER) grid integration and grid modernization. **OpenDSS Direct** is a cross-platform Python package that implements a "direct" library to OpenDSS using dss_python.

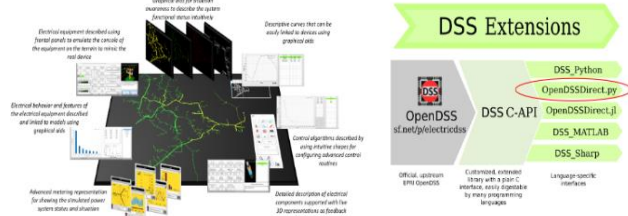


Figure 1. Sample of the teaching materials.

BACKGROUND: Since Spring 2020, HNEI has conducted a training program for PEA engineering interns in Hawai'i. This program has supported multiple classes of six engineering interns each. Each training session lasts for twelve weeks, includes 40 hours of classroom-based lectures tailored to working utility engineers, and is centered on customized hands-on mini-projects focused on energy distribution systems. The lectures cover subjects such as renewable energy integration and smart grid technologies, while the mini projects involve tasks such as developing controls for EV chargers, analyzing PV hosting capacity, studying virtual power plant (VPP) energy management, and optimizing microgrid design and operation.

PROJECT STATUS/RESULTS: Following COVID-19 travel restrictions in 2020–2021, HNEI GridSTART

successfully hosted two classes of PEA engineers in 2022, focusing on advanced energy technologies and applications. The interns engaged in various mini projects, including virtual power plant dispatch optimization, EV energy consumption estimation, PV hosting capacity assessment, and microgrid system design using the XENDEE platform. These hands-on projects leveraged GridSTART's expertise in distributed energy resources, advanced EV charging, and smart grid technologies.

Pattaya city, Chonburi, Thailand

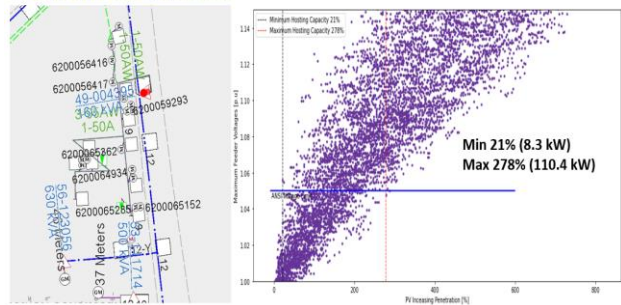


Figure 2. PV hosting capacity simulation on a PEA distribution feeder.

HNEI's hands-on technical assistance to PEA continued in December 2023, through its on-site support for PEA's commissioning of its microgrid on Koh Phaluai, an island in southern Thailand. This innovative system integrates 1 MW of PV, a 750 kW/1,500 kWh battery energy storage system (BESS), and two 300 kW diesel generators with a microgrid control system to provide utility electrical service to the residents of the island. The system is designed to operate without diesel generators when there is sufficient solar and BESS energy available to serve the load. While the internship program offered by HNEI GridSTART was temporarily paused in 2023 and 2024, plans are well underway to host a new class of PEA interns in February 2025. This internship class will advance the understanding and know-how of PEA engineers in conducting techno-economic analysis necessary to assess and develop optimal microgrid configurations, and design and test microgrid controls for system operation of an actual planned PEA microgrid site in Thailand.

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