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 (Grid*START*) developed a capacity-building program focused on topics of renewable energy grid integration, smart grid technologies, microgrid assessment and design, and development of advanced electric vehicle (EV) charging applications for engineers from the Provincial Electricity Authority of Thailand (PEA). The PEA is the distribution grid operator with a service territory spanning all of Thailand, except for the Bangkok metropolis and two adjoining provinces (Thailand has 77 total provinces).

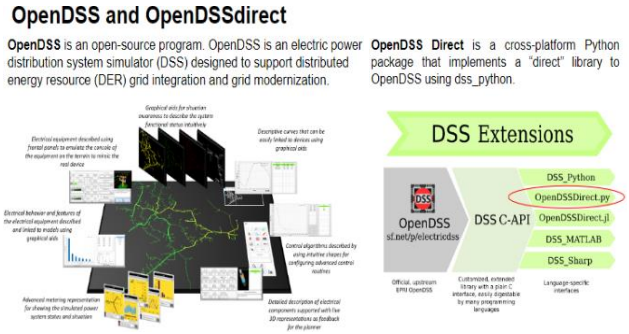

Figure 1. Sample of the teaching materials.

BACKGROUND: Since Spring 2020, HNEI Grid*START* has conducted a training program for select PEA engineering interns. This program accommodates two classes of six engineering interns each year. The program 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: Due to COVID-19 travel restrictions, the PEA intern program experienced delays and shifted partially to online learning in 2020-2021. In 2022, with the lifting of travel restrictions, two classes of PEA interns were trained at HNEI in two separate sessions. Each class was divided into sub-groups working on various mini-projects, which included optimizing VPP dispatch and demand response, improving EV energy consumption estimation, assessing PV hosting capacity, and designing optimized microgrid systems. The program is designed to substantially enhance PEA engineers' knowledge of distributed energy resource technologies, EV applications, and microgrids.

In the mini-projects for the 2022 intern classes, PEA engineers worked on economic dispatch for customer-sited PV and battery energy storage systems, enhancing EV energy consumption estimation algorithms, determining PV hosting capacity for distribution circuits, and assessing the feasibility of prospective microgrid sites in Thailand using the XENDEE modeling platform. The projects delivered deep hands-on experience and drew heavily on HNEI Grid*START*'s research, development, and testing expertise in the areas of distributed energy resources, advanced EV charging applications, and smart grid technology.

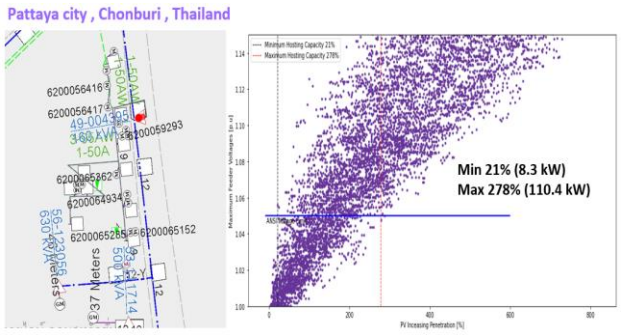

Figure 2. PV hosting capacity simulation on a PEA distribution feeder.

While the class curriculum and a mini-project focused on microgrid design and operation were developed for the incoming 2023 PEA intern classes, the PEA unexpectedly suspended travel to Hawai‘i due to unforeseen circumstances amid the ongoing repercussions and political conditions in Thailand following the contested results of the 2023 national elections. It is anticipated that the PEA intern training at HNEI will resume in 2024.

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