



Hawai'i Natural Energy Institute Research Highlights

Grid Integration & Renewable Power Generation

NELHA HOST Park Microgrid Analysis

OBJECTIVE AND SIGNIFICANCE: The objective of this project was to determine the feasibility and benefits of modifying the current energy system at Natural Energy Laboratory of Hawai'i Authority (NELHA)'s Hawai'i Ocean Science and Technology (HOST) Park to enable it to operate as a microgrid (or a number of microgrids) connected to the Hawai'i Electric Light Company (HELCO) electric grid system, or as a stand-alone facility. The study will determine those distribution system configurations providing optimal benefit to NELHA, the HELCO grid, and both together. A secondary objective is to maximize the use of renewable energy resources available within the HOST Park.



Figure 1. NELHA's HOST Park site and existing HELCO primary distribution feeder.

BACKGROUND: Microgrids, especially those integrating renewable energy resources, are of interest in Hawai'i for their potential to enhance the reliability of the microgrid site and host grid, to increase energy assurance, improve security, and potentially reduce cost and carbon footprint. Microgrids can also improve resilience against both manmade and natural disruptions. The Governor of Hawai'i signed Act 200, which directed the Hawai'i Public Utilities Commission (PUC) to open a proceeding to establish a microgrid services tariff to encourage and facilitate the development and use of microgrids throughout the State. NELHA's HOST Park facility has been identified by the PUC as a potential microgrid demonstration site for advanced technologies to enable grid resiliency. Along with techno-economic resource optimization, HNEI will identify regulatory and policy issues currently in place that hinder the development of microgrids and

offer modifications to those regulations and policies for future action.

To achieve the overall project objectives, a power system requirements analysis of the HOST Park based on NELHA's energy projections for a 10-year period will be conducted. Both the technical and regulatory/policy opportunities and barriers will then be assessed, with potential on-site distributed generation, energy storage, power management, and control technology alternatives evaluated to identify the most promising ones applicable to a microgrid or microgrids at the NELHA HOST Park. The work will deliver microgrid conceptual design options that meet NELHA's technical and economic power requirements over the 10-year planning horizon.

PROJECT STATUS/RESULTS: HNEI's GridSTART, in collaboration with NELHA staff, identified the existing and planned power generation and distribution infrastructure and requirements for the HOST Park. This work included a review of NELHA's HOST Park utility metered accounts, historical energy use and power demand, utility rate structures, distribution infrastructure, critical load priorities, load service reliability, existing emergency and renewable generation resources, and forward projected power needs. An integrated assessment of these energy system elements with the HELCO distribution infrastructure that serves the HOST Park has yielded conceptual microgrid design options. Detailed feasibility, techno-economic analysis, and optimization of these conceptual microgrid options continue.

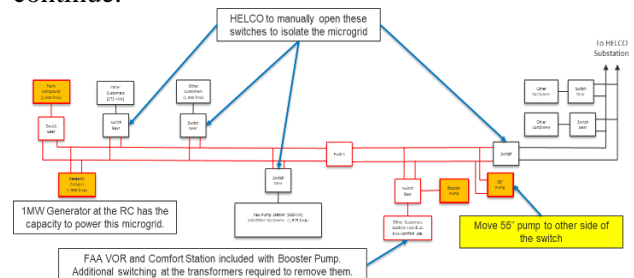


Figure 2. Potential HOST Park microgrid configuration for extended utility grid outage.

Funding Source: Hawai'i State Energy Office via NELHA

Contact: Leon Roose, lroose@hawaii.edu

Last Updated: October 2020