



# Hawai'i Natural Energy Institute Research Highlights

## Grid Integration & Energy Efficiency

### Hawai'i Virtual Power Plant (Hi-VPP) Demonstration

**OBJECTIVE AND SIGNIFICANCE:** HNEI GridSTART has developed the Hawai'i Virtual Power Plant Demonstration project (Hi-VPP). The project's primary goals are to: 1) assess the economic value and operational effectiveness of customer-sited battery and solar (BESS+PV) resources through demonstration and 2) evaluate the technology application and the value proposition, while prioritizing alternative use cases based on stakeholder interests and functional/economic trade-offs. These resources serve both the customer and the grid when aggregated as part of a virtual power plant (VPP).

This project is expected to provide key insights into the economic synergy, optimization of multiple services under BESS control, and the trade-offs between simple, low-bandwidth and advanced, highly coordinated methods of VPP aggregation. Ultimately, it will help in quantifying the business case for VPPs, including the value proposition for customer participation and utility utilization of the same.

**BACKGROUND:** Upon the successful conclusion of the JUMPSmart Maui (JSM) smart grid project funded by the New Energy and Industrial Technology Development Organization (NEDO) of Japan, HNEI negotiated an Equipment Transfer Agreement, through which HNEI acquired from NEDO significant grid assets deployed in the JSM project. HNEI GridSTART capitalized on this acquisition by utilizing the Sunverge Solar Integration System (SIS) BESS+PV units located at Haleakala Solar's business office to conduct this VPP project.



Figure 1. Sunverge SIS BESS + PV units on Maui.

**PROJECT STATUS/RESULTS:** HNEI GridSTART has designed control algorithms that integrate with building load forecasts and PV rooftop power generation forecasts. This integration optimizes the charge/discharge schedule of BESS units, effectively reducing electricity costs while ensuring power requirements are met during utility issued demand response events (Figure 2).

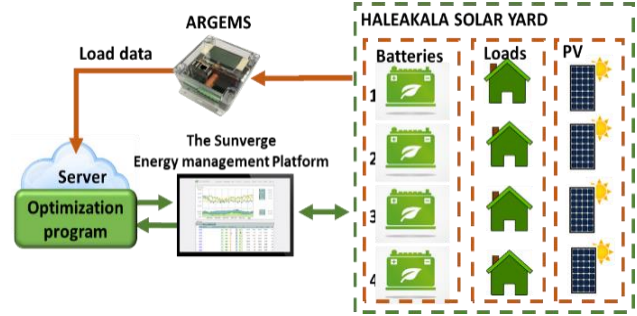


Figure 2. System overview of the project.

HNEI GridSTART is utilizing the data collected to develop a methodology to assess the potential benefits of customer participation in demand response programs offered by the Hawaiian Electric Company. This evaluation aims to determine the optimal VPP participation capacity, which in return could minimize customers' total electricity bills.

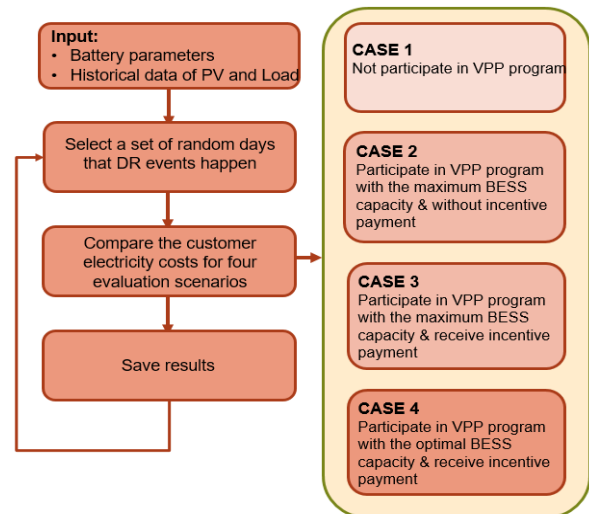


Figure 3. Evaluation process and case studies.

Through these demonstrations, HNEI GridSTART aims to test and evaluate the system's performance and functionality, thereby acquiring valuable insights and information for further analysis and decision-making. HNEI is currently in the process of preparing a conference proceeding paper that summarizes our research findings to date.

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