



Hawai'i Natural Energy Institute Research Highlights

International Support

Majuro Dock Resilient Power Strategy

OBJECTIVE AND SIGNIFICANCE: HNEI's Grid System Technologies Advanced Research Team (**GridSTART**) was contracted by the DAI Global, LLC in collaboration with Pacific International, Inc. (PII) to design a reliable, resilient, cost-effective and scalable power solution to support increases in the transshipment of skipjack tuna through a locally owned dock facility (Dock) on Majuro Atoll in the Republic of the Marshall Islands (RMI). Tuna transshipments through the Dock are essential not only to the global fishing industry, but also RMI's national economy.



Figure 1. HNEI and PII's Kramer family in Majuro, RMI.

BACKGROUND: Energy usage at the PII Dock is primarily a function of tuna-filled refrigerated container cooling loads, which are forecast to dramatically increase in step with tuna transshipment operations over the next decade. However, the electric service from the local electric utility, Marshalls Energy Company (MEC), is not reliable and its customers experience frequent power outages. In order to protect substantial perishable inventories, PII requires that it be able to serve 100% of its load via self-generation or other operational mechanisms when electric service from MEC is not available. HNEI **GridSTART** was engaged to analyze the techno-economic feasibility and benefits and develop a strategy for phased upgrades to the current Dock energy system to enable it to operate both as a microgrid connected to the MEC electric system and as a stand-alone facility. The analysis included evaluations of various combinations of existing and potential thermal and alternative energy generation resources and energy storage capabilities.

As a foundational component of its analysis, HNEI **GridSTART** projected hourly loads for the Dock at various stages of its expansion, including the addition of a planned 2,000 metric ton cold storage facility. Potential solutions to fill the gaps in PII's power and energy needs were evaluated utilizing the proprietary

XENDEE Microgrid Decision Support Platform, a microgrid optimization planning tool that evaluates the resiliency and cost-effectiveness of microgrid energy systems. The microgrid simulations performed in connection with this project considered fixed costs, energy bill savings and other variables (e.g., resiliency) to derive optimized microgrid designs, including optimized quantities of PV generation potentially including a battery energy storage system (BESS).

PROJECT STATUS/RESULTS: At a high level, the results indicate that there is an opportunity for PII to significantly reduce its operating costs and mitigate its business risks by maximizing self-generation, including solar PV panels on the roofs of its facilities, in lieu of relying upon the purchase of MEC-produced electrical energy. Additional measures such as the installation of a cold storage facility and/or more frequent transshipments of tuna off of the Dock could reduce operating costs even further. Such cost reductions could improve RMI's competitiveness in relation to the foreign vessels that currently transfer their tuna inventories offshore in the Majuro lagoon (with little or no benefit to the local economy).



Figure 2. Purse seiner fishing vessel moored at PII Dock.

The results of **GridSTART**'s analyses also appear to have caught the attention of international financing entities, which could potentially fund energy investments at the Dock capable of achieving solar PV penetrations as high as 40% over the 25-year life of the project.

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