



Hawai'i Natural Energy Institute Research Highlights

Energy Policy & Analysis

Decision Support Services to the Hawai'i Public Utility Commission

OBJECTIVE AND SIGNIFICANCE: HNEI provides regular technical analysis and assistance to the Hawai'i Public Utilities Commission (PUC). This support provides ongoing review of utility plans and technical challenges faced by the electricity grid during the transition to higher renewable energy. By providing an unbiased, technical review of utility plans and grid challenges, HNEI has established itself as a trusted third-party in ongoing dockets and policy discussions.

BACKGROUND: The PUC is the regulatory body tasked with reviewing and deciding on investment decisions, rates, and long-term planning of Hawai'i's investor-owned utility, Hawaiian Electric Company (HECO). They are also tasked with reviewing the reliability of the electric power system and its customers. At any point, there may be dozens of dockets under review by the Commission, many of which are based on highly technical and detailed analyses.

The topics under review by the PUC are diverse and multi-faceted. In the past, the PUC has been short-staffed and does not have access to the same modeling tools and skillsets typically deployed by the utility for their long-term planning and docket filings. As a result, having the ability to draw on the expertise of HNEI, and their contractor Telos Energy, provides independent third-party technical expertise to augment the analyses being conducted at the Commission. The flexible nature of this support ensures that work can be deployed in a timely and low-cost manner relative to the use of other third-party consultants. This collaboration with HNEI provides a flexible option to quickly analyze both near-term and long-term questions posed by the Commission.

Examples of recent support included a review of HECO's distributed energy resources (DER) rate design and grid service definitions [Docket #2019-0323], competitive solicitations in the Stage 1, 2, and Stage 3 utility energy procurements [Docket #2017-0352], ongoing reliability concerns on O'ahu and Maui [Docket #2021-0024], and the GHG Waiver of for renewable energy and storage systems [Docket #2024-0217].

This summary briefly discusses four recent examples of HNEI support to the PUC. These are also described in more detail in other project summaries located on HNEI's [Projects page](#).

- O'ahu reliability post AES retirement;
- Maui oil unit retirement and replacement;
- Firm renewable needs; and
- Time of use rates and DER rate design.

PROJECT STATUS/RESULTS: The HNEI-Telos team met with the Commission in person in March 2024 to discuss ongoing developments at the utility, HNEI analysis, and other critical issues for the state.

Clean Firm Resource Needs In Hawai'i: HNEI conducted a study to inform ongoing procurement and proposed legislation for both variable and firm renewable energy. It sought to determine the minimum amount of firm power that the system would require at various levels of wind, solar, and storage additions. It also informed decisions on whether to integrate more variable renewable energy today, considering that these decisions may shut the door on future options. This information can be used to determine characteristics of future systems to inform decisions on oil-fired power plant retirements, procurement of new resources, and to show how robust the system can be with variable renewable energy and storage alone.

In the past year, HNEI expanded that analysis to consider specific resources that could provide the firm renewable needs, including biodiesel, hydrogen, and multi-day energy storage and conducted a detailed assessment on the flexibility needs, if any, of new firm resources. This included a detailed representation of ramp rates and cycling capability, including the impact of solar and load forecast errors on utility operations.

At the end of 2023, HECO announced the final award group of the Stage 3 RFP [Docket #2017-0352], which included 700 MW of firm resources, including a contractual extension of the 208 MW Kalaeloa combined cycle plant and 60 MW Hāmākua plant, a HECO self-build proposal to repower the Waiiau plant with 253 MW of new gas turbines, and 175 MW of additional reciprocating engines or gas turbines across O'ahu and Maui. These proposals are currently under contract negotiations with HECO and expected

to be filed with the Public Utilities Commission in early 2025.

As specific projects are considered, HNEI will review proposals and provide recommendations and analysis to the Commission upon request. More information on this work can be found at <https://www.hnei.hawaii.edu/wp-content/uploads/Clean-Firm-Resource-Needs.pdf>.

Recent Reliability Challenges: The AES Hawai'i coal plant, the largest power plant on O'ahu retired on September 1, 2022. This retirement decreased the amount of dispatchable fossil capacity available to the utility by more than 10%. Throughout 2021, 2022, 2023, and 2024, the HNEI-Telos Energy team routinely conducted reliability analysis of the retirement to brief HECO, the PUC, and the Governor's Power Past Coal Task Force on the impacts of project delays, cancellations, and other events [Docket #2021-0024].

At the beginning of 2024 the Kapolei Energy Storage (KES) plant became operational, largely replacing the AES coal plant retirement. In addition, three of the four Stage 1 solar + storage projects started operating in the second half of 2023 or throughout 2024. While these additions helped improve the reliability situation on O'ahu, continued forced outages and reliability concerns of the steam oil fleet persisted throughout the year. As a result, grid reliability on O'ahu continued to be challenged throughout 2024.

Throughout 2024, HNEI regularly reviewed operational data from new systems, tracked outage rates on existing oil-fired capacity, and conducted post-mortems on grid reliability events. The objective of this ongoing study is to evaluate the ability of proposed solar + storage resources to provide the required energy needed while also maintaining grid reliability with the pending AES coal plant retirement. The results of this work are expected to have important implications for power system planning and policy for O'ahu.

Stochastic analysis, using the tools developed by the HNEI-Telos Energy team and reported in 2022, are being used to assess capacity reliability risks associated with the new resource mix on O'ahu, including updates for utility plans, impacts due to

delays in project schedules, new trends in HECO's generator outage rates, and changes to system load.

Analysis shows that while there was a resource adequacy shortfall in January 2024, this largely stemmed from outages at the Waiau power plant and did not result from the recent transition to solar and storage resources. In addition, another review of grid operations in July 2024 showed that new solar and battery storage resources were instrumental in maintaining grid reliability after three of the largest oil-fired power plants went on outage simultaneously. More information on this work can be found at <https://www.hnei.hawaii.edu/wp-content/uploads/Recent-Reliability-Challenges.pdf>.

Maui Oil Unit Retirement and Replacement: The Kahului Power Plant (KPP) was originally scheduled to retire by the end of 2024, but this date was extended to the end of 2027 due to reliability concerns on Maui. Analysis from 2021-2023 showed how the retirement could be reliably achieved with proposed solar + storage projects. Since that analysis, project delays have occurred with replacement resources. In addition, the Mā'alaea M10-M13 diesel engine may need to be retired earlier than expected. The combined retirements would represent the loss of over 85 MW of firm capacity, over 40% of Maui's peak demand.

Similar to the work conducted in O'ahu, the objective of this study was to reevaluate Maui's reliability if one or both of the plants are retired and evaluate potential mitigations necessary. The results of this analysis were briefed to the PUC [Docket #2021-0024] and the Maui Accelerating Clean Energy & Decarbonization Technical Working Group (ACET) and are expected to have important implications for power system planning and policy for Maui.

The HNEI-Telos team continues to monitor ongoing developments in Maui, including the status of Stage 1 and Stage 2 project commissioning and cancellations, adoption of DER and BTM storage, peak load levels, and generator reliability. While the M10-13 plants are expected to remain available until sometime between 2027-2029, any new capacity additions beyond those under development in Stage 1 and 2 will likely take significant time to develop. As a result, HNEI will continue to support the Commission with

independent reviews of Maui reliability. More information on this work can be found at <https://www.hnei.hawaii.edu/wp-content/uploads/Maui-Near-Term-Grid-Reliability.pdf>.

Analysis of TOU Rates and Load Flexibility: In 2024, there were two notable developments at the Commission. The first was the initial voluntary implementation of HECO’s new time of use (TOU) rates and new DER tariffs for exported generation [Docket #2019-0323]. To support the Commission in their review of these priorities, the HNEI-Telos team conducted a TOU Rate analysis.

This work continued the review of HECO’s AMI data to calculate changes to bill payments with and without the new TOU structure, but extended the analysis to evaluate the potential grid benefits of shifted load profiles. This included potential energy savings and reduced oil consumption, as well as deferred capacity savings through reduced on-peak consumption. Results of this analysis showed that while TOU rates can shift generation to periods when solar is more available, recent additions of battery energy storage saturated the benefits that this type of load shifting could provide.

As the regulatory priorities in Hawai‘i continue to shift, HNEI will support ongoing analysis and recommendations to ensure a fair, cost-effective, renewable energy transition for the state. In 2024, HNEI anticipates supporting a review of the Stage 3 RFPs, ongoing reliability concerns, and further support for land use and equity concerns. More information on this work can be found at <https://www.hnei.hawaii.edu/wp-content/uploads/Analysis-of-TOU-Rates.pdf>.

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