OBJECTIVE AND SIGNIFICANCE: The objective of this study is to conduct a comprehensive study to determine best practices for disposal, recycling, or secondary use of clean energy products in the State. In recent years, Hawaiʻi has seen significant growth in the use of solar photovoltaic (PV) panels. This is expected to continue with new systems, both rooftop and utility scale, combined with battery energy storage systems.

This situation will produce significant waste over the next 20-30 years. The objective of this work is to quantify this waste stream and to identify potential hazardous materials, as well as those that may offer opportunity for cost-effective recycle. As Hawaiʻi faces the dual concern of possessing limited disposal options while hosting a significant amount of installed PV and storage materials, outcomes from this work will help guide policy development in Hawaiʻi.

BACKGROUND: The 2021 Hawaiʻi State Legislature, passed House Bill 1333, which requires that the Hawaiʻi Natural Energy Institute (HNEI), in consultation with the Hawaiʻi State Department of Health, conduct a comprehensive study to determine the best practices for disposal and recycling of discarded clean energy products in Hawaiʻi. Specific outcomes are to address: 1) the amount of PV and solar water heater panels in the State that will need to be disposed of or recycled, 2) other types of clean energy materials expected to be discarded in the State including glass, frames, wiring, inverters, and batteries, 3) the type and chemical composition of those clean energy materials, 4) best practices for collection, disposal, and recycling of those clean energy materials, 5) whether a fee should be charged for disposal or recycling of those clean energy materials, and 6) any other issues the Hawaiʻi State Energy Office and Department of Health consider appropriate.

PROJECT STATUS/RESULTS: This project commenced in September 2021 and remains ongoing. Findings to date includes 1) identifying material composition of PV panels, inverters, cabling, and mounting equipment as a function of installed power (kg/kW), 2) cumulative installed PV by island for residential, commercial, and utility scale since 2005, 3) the projected loading rate of aging PV materials as far out as 2045, 4) preliminary estimates of installed battery capacity as residential, commercial, and utility scale, and 5) estimates of material composition of PV battery as a function of installed power (kg/kW).

As of 2021, it is estimated that 3.86 million modules have been installed on Oʻahu, 720,000 in Maui County, 580,000 in Hawaiʻi County, and 480,000 on Kauaʻi. A total of 225,000 tons of PV related clean energy materials have been installed in Hawaiʻi through 2021. For context, the total amount of municipal solid waste and commercial/demolition waste generated in the State during 2021 was 2,570,478 tons. This suggests that the total amount of these PV related clean energy materials installed to date total 8.8% of all municipal solid waste and commercial/demolition waste generated across the entire State in 2021.

These and other results have been summarized in detail in a separate report to be submitted to the legislature in January 2023.

Funding Source: Energy Systems Development Special Fund

Contact: Michael Cooney, mcooney@hawaii.edu

Last Updated: November 2022