

U.S. Navy Wave Energy Test Site



The U.S. Navy's Wave Energy Test Site (WETS), the United States' first grid-connected test site of this kind, was completed by the Navy in mid-2015. The Hawai'i Natural Energy Institute (HNEI) is providing key research support to this national effort in the form of environmental monitoring, independent wave energy conversion (WEC) device power performance and durability analysis, and critical marine logistical support.

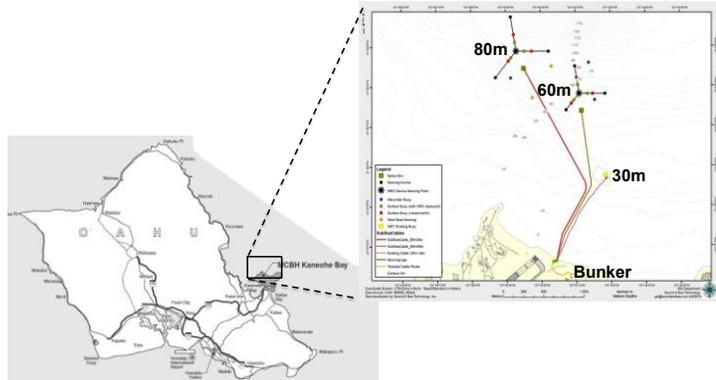


Figure 1. Location of the Hawai'i Wave Energy Test Site (WETS).

Challenge & Significance

Wave energy has enormous potential to address global renewable energy goals, yet it poses daunting challenges related to commercializing technologies that must produce cost-competitive electricity while surviving the energetic and corrosive marine environment. The nascent commercial wave energy sector is thus critically dependent on available test infrastructure to address these issues.

WETS is located offshore the Marine Corps Base Hawai'i (MCBH) on the windward side of O'ahu (Figure 1). It consists of test berths at 30m, 60m, and 80m water depths, and can host point absorber and oscillating water column devices to a peak power of 1 MW. The results achieved at WETS will have far reaching impacts in terms of advancing wave energy as a whole.

Status & Accomplishments

- Navy environmental assessment for new deep berths, with input from HNEI in the form of wave resource/bottom surveys and monitoring plans, completed February 2014.
- Navy deployed 60m and 80m berths in September 2014, cabled to shore in June 2015.
- HNEI environmental monitoring program commenced October 2014 to obtain baseline conditions, now collecting data in presence of WECs.
- Northwest Energy Innovations (NWEI) deployed 18kW Azura device at 30m berth in late May 2015.

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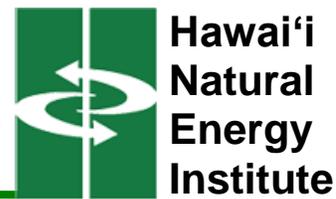
Period of Performance:
2008-2018

Partner(s):
[Sea Engineering, Inc](#)

Funding:

- Naval Facilities Engineering Command (NAVFAC) through Applied Research Laboratory at the University of Hawai'i (ARL-UH)
- Department of Energy (DOE) (via Hawaii National Marine Renewable Energy Center)
- Office of Naval Research
- State of Hawai'i

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- Navy and DOE have selected four companies for testing at the deep berths from 2016 through 2018 (Figure 2):
 - Sound and Sea Technology deployed Fred.Olsen point absorber Lifesaver in March 2016 for a 6-month test, with likely extension to 1 year
 - Ocean Energy, USA to deploy 500kW oscillating water column device in early 2017 for 1 year
 - Columbia Power Technologies to deploy 500kW point absorber StingRay for 1 year in 2018
 - NWEI to deploy grid-scale point absorber device in 2018.

Project Detail

Through a cooperative effort between the Navy and the US Department of Energy (DOE), WETS will host companies seeking to test their pre-commercial WEC devices in an operational setting, enabling them to advance their device technology readiness level. Initial funding opportunities by Navy and DOE have resulted in a set of five devices to be tested through 2018. Important additional research support to the project comes from the Office of Naval Research and the State of Hawai'i. HNEI is

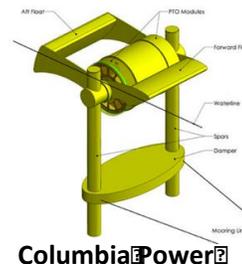


Figure 2. Four companies that will utilize deep berths at WETS for testing devices.

working with the Navy and DOE to directly support WEC testing at WETS in three key ways: 1) environmental impact monitoring (acoustic and EMF signatures, sediment transport, and ecological surveys), 2) independent WEC device performance analysis (power performance and device durability), and 3) logistics support through a site-dedicated at-sea support platform. Performance analysis consists of robust wave environment measurements, wave forecast modeling, device power output monitoring to characterize performance as a function of wave state, and regular diver and ROV inspections of the deployed devices and associated mooring and cabling infrastructure to assess device and infrastructure durability. UH will also utilize data from WETS to advance geophysical fluid dynamics-based models of device performance to guide design improvements and to advance the state of WEC array modeling. HNEI has contracted with local ocean engineering company Sea Engineering, Inc. to provide a site-dedicated support vessel, outfitted with dive and ROV facilities, an A-frame, and workspaces for WEC developers and UH scientists/engineers. This platform will be kept at a state marina within an hour's transit from the site. Further, a limited amount of emergency maintenance response will be provided to tenants at WETS, furthering HNEI's ability to fully document device durability issues and develop operational and maintenance protocols for DOE and the Navy.

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