



SWEPT LAB SANDIA WAVE ENERGY POWER TAKE-OFF

The Sandia Wave Energy Power Take-off (SWEPT) Lab tests wave energy converter (WEC) power take-off (PTO) systems. WECs are unique because they convert the oscillatory mechanical energy from ocean waves to generate electricity. This differentiates them from other technologies that harness a relatively steady input of mechanical energy (e.g., wind turbines or hydroelectric power technologies). Because of their unique way of converting energy, WEC PTO systems require specialized methods and facilities for their design and testing.

HOW SWEPT WORKS

The SWEPT Lab uses hydraulic machinery to simulate the input from the ocean waves (including wave forcing and WEC hydrodynamics), allowing for hardware in-the-loop (HIL) testing of PTO systems for system identification (SID), real-time control, reliability analysis, and grid interface analyses.

CAPABILITIES

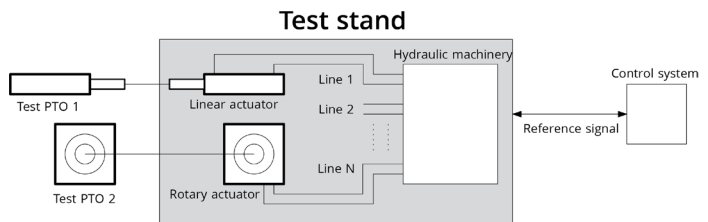
At the SWEPT Lab, rotational and linear WEC PTOs can be tested independently or in parallel in order to simulate an array of devices. PTOs with power between 5 and 500 kW

($5 < P < 500\text{kW}$) and frequencies up to 2 Hz ($0 < f < 2$) can be tested using the lab's large-scale hydraulic actuators and modular systems. A series of linear actuators—the largest with a net stroke of 4 meters—is available to allow for testing of PTOs from model-scale through ocean-deployed systems. The SWEPT Lab also includes high-performance real-time computing hardware for performing HIL analyses, including array analyses and grid modeling.

The SWEPT lab can test multiple degrees-of-freedom with independent control. It simulates the dynamics (inertia, damping, stiffness, multi-body links) of full-scale WECs, as well as the input from waves and wave-body interactions.

The SWEPT lab can provide:

- Accelerated life testing
- Dry tests
- Bench tests



LAB STUDIES AND ACTIVITIES

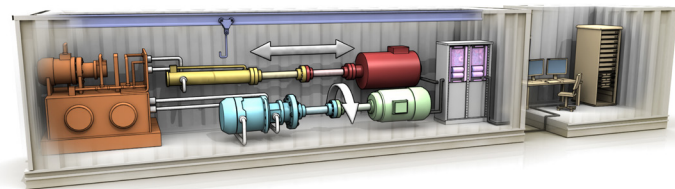
This system will allow for PTO studies including:

- System identification (SID)
- Real-time control
- Reliability analysis
- Grid interface simulations

\$1.2M of internal (Sandia) funding

Learn more:

energy.sandia.gov/keycapabilities/facilities/swept-lab



Hydraulic Power Unit	Hydraulic Motor	Overhead Trolley System
Hydraulic Piston	Rotational Generator	Real Time Control System
Linear Generator	DC Bus	