Researchers have been using the large-amplitude motion platform to validate wave energy converter devices, such as the HERO WEC, NREL's first wave-powered desalination system. *Photo by Josh Bauer, NREL*

Large-Amplitude Motion Platform: A New Ocean Simulator Can Help Technologies Succeed

Offshore renewable energy technologies—like wave energy devices, wind turbines, floating solar panels, and hybrid systems—can help decarbonize our power grids as well as offshore activities like international shipping and seafood farming.

But it's not always easy to build technologies hearty enough to operate in a powerful ocean environment. And subjecting promising prototypes to real ocean waves can be an expensive, time-consuming, and risky way to get these technologies ready for the high seas.

Now, with the National Renewable Energy Laboratory's (NREL's) new testing platform, called the large-amplitude motion platform (or LAMP for short), our experts can replicate powerful ocean waves in a low-risk laboratory setting. The LAMP, coupled with NREL's diverse array of testing instrumentation, can help technology developers rapidly hone their prototypes before embarking on a potentially costly and time-consuming ocean trial.

What Can the LAMP Do?

Both researchers and offshore energy technology developers can use the LAMP testing platform to validate technologies of any size—from small-scale to full-scale prototypes—in a dry environment. The LAMP can emulate many of the typical wave states in U.S. coastal waters and can also:

- Support a payload of up to 22,000 pounds or 10,000 kilograms
- Perform the six different degree-of-freedom motions that occur in the ocean, including surges of up to 2.5 meters (m), sways up to 2.3 m, and heaves up to 1.8 m
- Accelerate prototypes up to 4.5 m/s under full load conditions
- Use real wave data to mimic actual sea conditions and modify motions in real time
- Integrate with real-time controllers for hardware-in-the-loop testing
- Modify test article mounting and configurations due to its 3-m diameter mounting frame
- Provide flexible data acquisition system support for both LAMP motion and test article measurements
- Test marine energy power take-off systems, components, and full devices.

With NREL's LAMP, which is housed at the lab's Flatirons Campus, researchers and technology developers can quickly identify potential flaws, so they can fine-tune their designs. The LAMP can be used with other Flatirons Campus capabilities to test technology integration, system integration, and control strategies. Researchers can, for example, pair the LAMP with NREL's wave tank, grid integration tools (including the lab's Advanced Research on Integrated Energy Systems platform), and dynamometers, which can simulate ocean conditions.

What Additional Support Can LAMP Users Receive?

At NREL's Flatirons Campus, you can benefit from:

- An overhead crane, which enables users to quickly and easily install and remove test articles and reconfigure or troubleshoot setups
- A suite of testing technologies to further validate devices
- Knowledgeable engineers, researchers, and technicians with decades of experience testing and designing novel renewable energy technologies.

The lab's large-amplitude motion platform, or LAMP, can mimic ocean motions, including waves up to 8 feet high, and support devices weighing about as much as a small recreational vehicle.
Photo by Bryan Bechtold, NREL

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How Can You Benefit From the LAMP?

If you're interested in partnering with NREL's experts to accelerate the development of your offshore energy technology, we encourage you to get in touch. Our Flatirons Campus offers a suite of instrumentation that can help you hone your theoretical design, test your generator, or collect data on how your full-scale prototype handles a simulated ocean.

nrel.gov/water/motion-platform.html

Contact:

- Get a closer look at all our facilities have to offer at nrel.gov/water/facilities.html.
- Contact Rebecca Fao to learn more: Rebecca.Fao@nrel.gov
- *The LAMP was built by E2M in the Netherlands and was installed with funding from the U.S. Department of Energy's Water Power Technologies Office.*

NREL Transforming ENERGY

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