



NREL's Marine Energy Atlas is just one of the lab's free, publicly available modelling tools created to help the marine energy industry design cost-effective, commercially viable technologies. *Photo by Taylor Mankle, NREL*

# Modeling the Path Forward for Marine Energy

Today's **marine energy** industry is at an exciting turning point. Companies are testing out their early-stage prototypes—designed to harness the clean energy in ocean and river waves, currents, and tides—in their first open-water trials. But while such trials are a necessary step toward commercialization, they can come with high costs and risk if the deployments do not go as planned.

Luckily, experts at the National Renewable Energy Laboratory (NREL) design tools to reduce the costs and risks of developing novel marine energy technologies. Free and publicly available, these software models provide data on a device's potential performance, the resources (waves, tides, and currents) available at deployment sites across the United States, and costs associated with installing and operating marine energy technologies. With fast and accurate data, developers can learn how to optimize their designs—and reduce time, costs, and risks—before prototypes head into the water.

## Marine Energy Atlas Adds Historical Data and Capacity Factor Tool

The **Marine Energy Atlas** is an interactive mapping tool that anyone can use to explore U.S. marine energy resources. Users can zoom in on the United States' East and West coasts, Hawaii, or Alaska to see how high waves get or how fast currents move in those waters. Near shore, the atlas provides a data point every 200 meters; such high spatial resolution is unique to the Marine Energy Atlas and a boon for marine energy developers searching for an ideal spot to install their device. In 2022, the Marine Energy Atlas team released two new major features, which include:

- More hindcast (or historical) data for researchers to create models that more accurately predict future climate scenarios. Users can now access data points collected every three hours over 42 years of waves. (By Spring 2023, the tool will ingest even more data from the international [Ocean Energy Systems' global mapping tool](#)).
- A **new Capacity Factor Tool**, which allows users to upload information on their wave energy device and estimate how much electricity it could produce in specific sites—in just a few minutes.

The Marine Energy Atlas was developed by NREL's [resource characterization team](#) and funded by the U.S. Department of Energy's Water Power Technologies Office.

## System Advisor Model Gets New Data and Features

NREL's **System Advisor Model (SAM)** provides detailed performance and financial analysis for a suite of renewable energy technologies. With SAM's marine energy module, users can model the system cost and power performance of wave and tidal energy systems. SAM users can also quickly simulate and compare how a variety of technology designs might perform—in terms of energy production and financial performance—with SAM's reliable and standardized techno-economic tool.

In 2021, the SAM team added wave energy resource data from NREL's Marine Energy Atlas tool. With that new data, SAM can model potential energy production at a vast array of U.S. site locations on a daily, weekly, and monthly basis. In 2022, the SAM team further expanded the tool's analysis capabilities by adding additional financial cash flow models that will enable users to model custom project lifetimes (the tool previously defaulted to a 20-year timeline). This will improve modeling of marine energy systems used for [powering the blue economy applications](#), like wave-powered water desalination systems, which may not share the traditional project lifetimes of most utility power generation systems.

The updated marine energy SAM tool will continue to provide industry with the analyses it needs to build cost-effective designs based on reliable, standardized data.

## Better Data Guides the Future of Marine Energy Technology

NREL will continue to add new features and capabilities to both the Marine Energy Atlas and SAM software models. Better, more comprehensive data means more accurate estimates for marine energy developers and researchers, which could help accelerate the development of cost-effective, resilient marine energy technologies.

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