

POWERING the BLUE ECONOMY™

Exploring Opportunities for Marine Renewable Energy in Maritime Markets

U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY



➔ The ocean economy transports close to **90% of world trade**, provides **17% of the world's food**, and contributes **billions of dollars to the global economy**.

As this economy grows, we need to build a sustainable system to preserve and regenerate the health of ocean ecosystems.



Top photo: Powering the Blue Economy initiative aims to explore how to sustainably use ocean resources to support the ocean's life and livelihood, and in turn, how the ocean can support our lives and livelihood. Photo by Northwest Energy Innovations

POWERING the BLUE ECONOMY™

To spur economic growth and revitalize the ocean the U.S. Department of Energy's (DOE's) Water Power Technologies Office (WPTO) launched the Powering the Blue Economy™ (PBE) initiative, which aims to foster long-term, sustainable growth of the blue economy by:

- Protecting the ocean and understanding and leveraging its immense power
- Learning the power needs of emerging coastal and maritime markets
- Advancing marine renewable energy technologies.

Remote and island communities, areas hit hard by natural disasters, and ocean researchers can also benefit from renewable energy found in the ocean.



Waves, currents, tides, and water temperature all serve as renewable power sources for marine energy.



Defining the Blue Economy

The sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems.

—The World Bank



Powering the Blue Economy Funding

WPTO is using traditional and nontraditional funding opportunities to support creative marine energy technology researchers and innovators across the United States. These investments will not only boost the country's efforts to reduce carbon emissions and address climate change but will also create jobs and strengthen the economy at the same time. Additionally, WPTO provides funding for universities, national laboratories, and other research institutions through competitive programs and continues to create new ways to support marine energy advancement.



Novel Methods, Rewarding Results

WPTO organizes targeted challenges through prizes and competitions to both inspire innovators to work in marine energy and diversify ideas and funding awardees. Between 2019 and 2021, WPTO launched two multimillion-dollar prizes and a collegiate competition, bringing in applicants from industry, entrepreneurial, nonprofit, and academic sectors.

Marine energy has been around for centuries but has not evolved at the same rate as other forms of renewable energy. To help accelerate technology development, PBE-initiative prizes and competitions ask problem solvers across the United States to look at marine energy in new ways and design novel systems.

These prizes and competitions are intended to be more accessible than traditional funding opportunities, attracting a wider pool of applicants and a diverse group of entrepreneurs, students, academics, hardware developers, and other innovators. In so doing, the prizes and competitions:

- Unlock the potential of new, ocean-powered technologies
- Enhance scientific discovery in the ocean
- Provide more sustainable sources of energy for remote, coastal, and island communities.

So far, WPTO's prizes and competitions have attracted over 150 unique teams that have applied for and competed in PBE-initiative challenges. These innovators will help our country meet the impacts of climate change, spur the transition to a sustainable and equitable clean energy economy, and accelerate the creation of new jobs and professional opportunities.

In the [Waves to Water Prize](#), innovators create wave-powered desalination systems, which could provide drinking water for coastal communities and natural disaster recovery scenarios.

In the [Ocean Observing Prize](#), innovators pair marine energy with ocean observation platforms to collect the data needed to understand, map, and monitor the ocean.

In the [Marine Energy Collegiate Competition](#), undergraduate and graduate students offer unique solutions to the emerging marine energy industry and explore opportunities for marine energy technologies to benefit other, existing maritime industries.





Discovering Knowledge in Every Corner

The ocean is a rugged and challenging environment. To design marine energy devices for blue economy applications, experts from diverse disciplines and sectors need to work together. That is why WPTO collaborates with other federal agencies, research institutions, organizations, and industry leaders to fund and accelerate the development of novel marine energy technologies.

Partnering with the U.S. Economic Development Administration, WPTO launched the [Blue Economy Industry Challenge](#). This partnership provides funding for startup incubators, accelerators, and other innovation hubs that support a range of regional entrepreneurial activities relating to generating power from oceans, rivers, and other freshwater and marine environments.

Through the [Small Business Innovation Research](#) and [Small Business Technology Transfer](#) programs, WPTO also funds small companies to innovate new marine energy technologies. This program aims to move designs and ideas through prototype development to commercialization.

Some smaller research projects need funding to first assess the potential for and merit of future research. For this reason, WPTO started the [Seedlings Program](#), which gives researchers at national laboratories, like the National Renewable Energy Laboratory, Pacific Northwest National Laboratory, and Sandia National Laboratories, an opportunity to test innovative ideas using short-term projects that have the potential to grow into long-term endeavors. Already, several national laboratories have capitalized on this program to explore novel ideas in ocean observation, aquaculture, microgrids, seawater mineral extraction, and small-scale energy harvesting devices.



The PBE initiative funds crosscutting research and development to support small marine energy powered systems and to connect end users with technological solutions across the blue economy. *Photo by NREL*

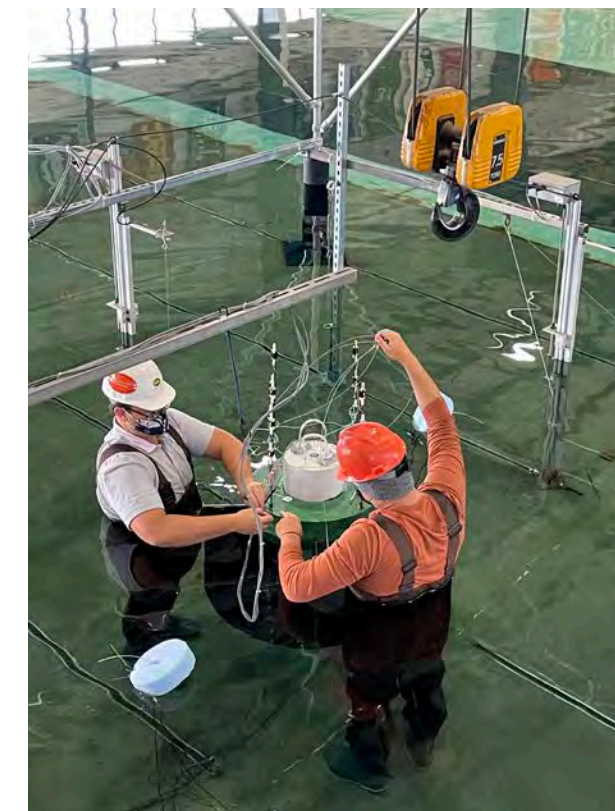


→ Innovative Testing

Testing marine energy systems can be difficult and time-consuming because of weather, permitting, vessel chartering, and other factors. These variables limit access to useful information and/or delay technology advancement. To overcome these barriers, the PBE initiative invests in world-class testing facilities so technology developers can quickly assess how their devices and components perform, find new solutions where necessary, and deploy next-generation devices.

The DOE-sponsored Testing Expertise and Access for Marine Energy Research (TEAMER™) program is directed by the Pacific Ocean Energy Trust and aims to address some of the barriers that hinder advancements in the blue economy for marine energy developers and researchers. The TEAMER program grants innovators access to the nation's best marine energy testing facilities and awards funding for marine renewable energy testing and development projects.

To assist the initiative's goal to move marine energy technologies closer to market, TEAMER helps researchers and developers refine their blue economy technologies, advance toward commercial viability, and navigate development and testing barriers. More broadly, DOE's national laboratories, national marine energy centers, research institutions, and universities across the country are poised to help build this critical infrastructure by conducting blue economy research that makes marine energy testing easily accessible.



TEAMER is opening the doors to our nation's best marine energy testing facilities and the experts who work there. *Photo by Hinsdale Wave Research Lab*



Supporting Foundational Research

While sustaining marine life, WPTO funds everything from research and development to deployment of marine energy technologies. But funding early-stage research and development is especially critical. Such support encourages industry organizations, universities, and national laboratories to work together to find the best solutions for real-world applications.

Under the PBE initiative, researchers at the Pacific Northwest National Laboratory and the National Renewable Energy Laboratory are already engaged in fundamental research, investigating:

- Power needs for blue economy sectors
- The feasibility of marine energy for different applications
- Designs for small-scale marine energy technologies.

Prizes and competitions, TEAMER, academic research, and work at five national laboratories all advance the foundational research that is necessary to develop and evolve blue economy solutions. Supporting foundational research and development is part of WPTO's mission to:

- Improve access to marine energy testing infrastructure
- Augment existing offshore renewable energy activities that face a challenging ocean environment
- Help accelerate emerging blue economy applications and technology optimization while keeping an eye on end-user needs
- Support energy independence for remote, coastal, and island communities.



Team members deploy a preliminary testing device that supports foundational research for small, modular, wave-powered desalination systems at Jennette's Pier in Dare County, North Carolina. *Photo by Coastal Studies Institute*

Energy Transitions Initiative
Partnership Project

Igiugig Village



Connecting with Communities

Many remote and islanded communities across the United States face complex and costly energy challenges. WPTO is working to help these communities transition away from diesel-dependent systems that lack resilience and toward an independent energy future that is equitable, sustainable, and resilient.

In collaboration with various local community partners and community organizations, WPTO funds and develops technical assistance programs to provide remote, coastal, and island communities access to energy expertise and on-the-ground support. To support inclusive clean energy transitions, WPTO and its partners collaborate with communities to:

- Identify and provide tools, technical expertise, and solutions for communities to make strategic energy planning choices and define resilience goals while prioritizing local challenges and values
- Advance community-centered design processes that focus on demonstrating and deploying marine energy technologies that benefit the community
- Focus on core challenges of energy innovation in ocean-centric, coastal communities
- Provide guidance on energy integration challenges, microgrids, energy storage, and hybrid systems
- Provide technical expertise on energy and coastal resilience challenges
- Tailor technology needs to individual communities.



Research, development, and deployment of marine energy technologies support WPTO's mission to improve capabilities to study the ocean, and support energy innovation for remote, coastal, and island communities. *Photo by iStock*

Igiugig Village, Alaska

From coastal Hawaiian towns to remote, Indigenous villages in Alaska, WPTO seeks to deliver energy solutions to a wide range of rural and isolated communities in the United States. Recently, the office helped fund a water power demonstration project, developed and deployed by the Ocean Renewable Power Company, in the remote [village of Igiugig](#) in southwestern Alaska, whose population of 70 relied on a diesel-powered microgrid. The hydrokinetic turbine system, RivGen, uses river currents to provide clean and renewable energy to the village, reduces their dependency on costly diesel, and preserves the river's ecosystem. Knowledge gained from the early-stage RivGen marine energy system could help other remote communities gain access to renewable power.

Energy Transitions Initiative Partnership Project

Through the [Energy Transitions Initiative Partnership Project](#), WPTO, in partnership with the Energy Transitions Initiative and the Solar Energy Technologies Office, connects remote and island communities with regional stakeholder organizations and experts from national laboratories to focus on the energy-resilience challenges that communities identify. Launched in 2020, the project builds a broad coalition of experts to provide technical assistance to remote and island communities so they can make informed decisions regarding their energy choices and build greater community resilience.

The Energy Transitions Initiative Partnership Project provides long-term technical assistance to communities over a 12–18-month period. During this time, the national labs work alongside community-based partner organizations to assist communities in developing community-driven work plans that both support energy-system planning and implement and prioritize community security, sustainability, and self-sufficiency. The program aims to empower communities to identify and advance strategic, whole-system solutions tailored to their needs.





Collaboration

WPTO collaborates with a variety of partners to further support research and development and achieve the PBE initiative's near-term and long-term goals.

Partnerships

Since the PBE initiative started in 2019, WPTO has partnered with a range of industry organizations, incubators and accelerators, universities, and other federal agencies to help advance marine energy technology and attract a diverse community of innovators.

WPTO will continue to form and maintain strategic partnerships that help accelerate the commercialization of marine energy technologies. For example, with help from the National Oceanic and Atmospheric Administration and the Coastal Studies Institute on PBE prizes, WPTO can test water-powered devices in real-world scenarios. This helps fast-track the development of marine energy and identify technologies that will be most impactful for end users. Through these partnerships, WPTO aims to expand access to power for remote, coastal, and island communities and improve capabilities for researchers to study the ocean.

A preliminary testing device that supports foundational research for small, modular, wave-powered desalination systems floats in the water at Jennette's Pier in Dare County, North Carolina. *Photo by Coastal Studies Institute*



Sponsorships

For the first time, DOE has established formal sponsorships with industry organizations to support prize and competition competitors, with WPTO forming 12 as of 2021. Sponsors are critical to improving the competitiveness of blue economy technologies and startups. They support everything from commercialization of innovative technologies to community-focused efforts that raise awareness for transformative solutions.

Companies choose to sponsor the PBE initiative to strengthen research and innovation communities by providing access to software, outreach, mentorship, and design consultation.

The PBE community is always growing, and WPTO welcomes fresh ideas on how to help power the blue economy.



Learn More

If your organization is interested in joining this unique community of private- and public-sector professionals:



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