Marine Energy Program Overview

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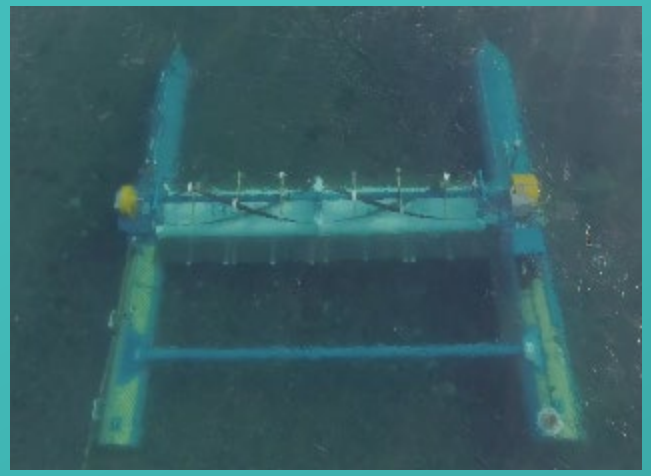
July 18, 2022

Marine Energy: Many Different Opportunities

Wave

Tidal



Ocean/River Current

Ocean Thermal Energy Conversion

Salinity/Pressure Gradients

Marine Energy Program Vision and Mission

VISION: A U.S. marine energy industry that expands and diversifies the nation's energy portfolio by responsibly delivering power from ocean and river resources.

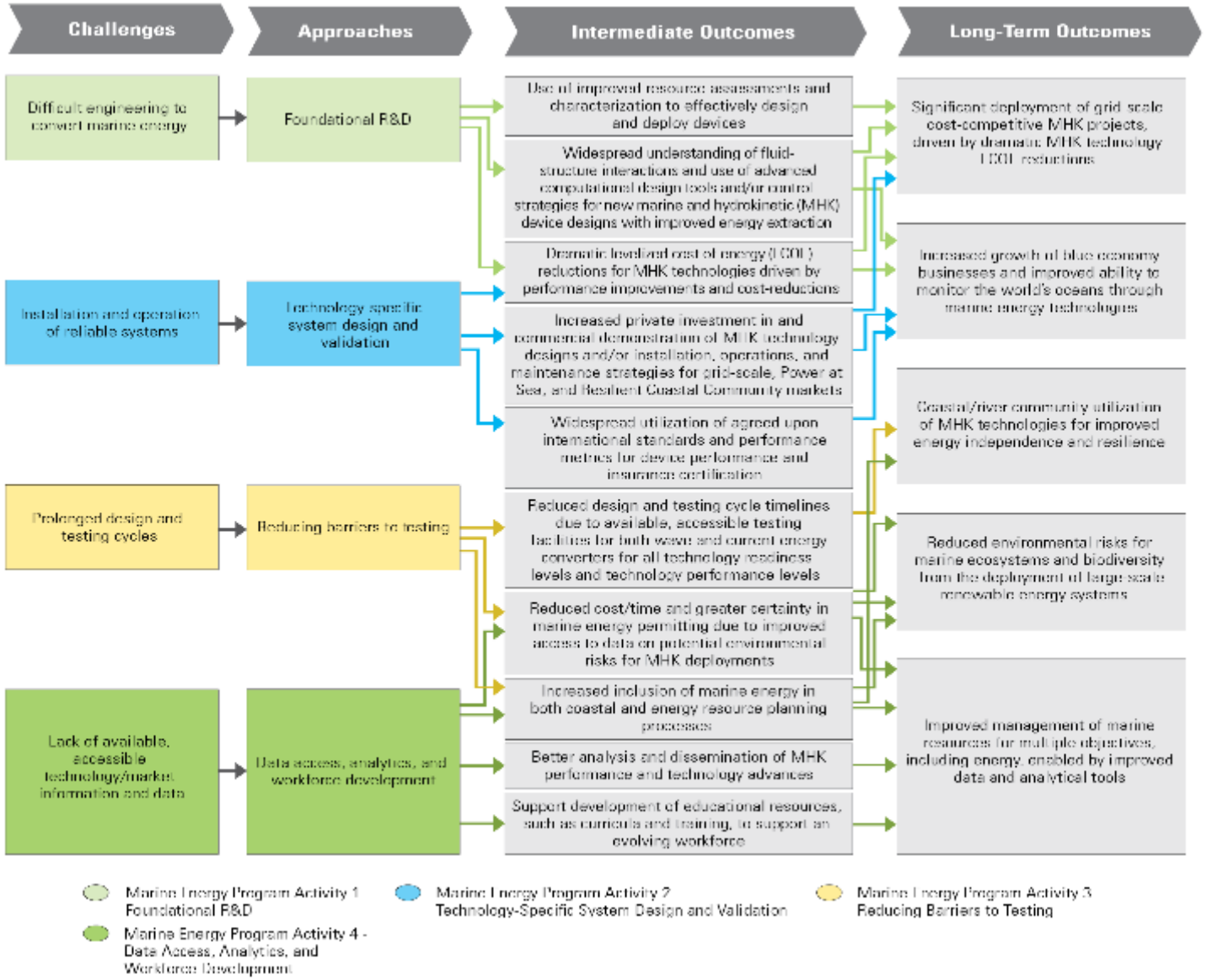
MISSION: Conduct research, development, demonstration, and commercial activities that advances reliable, cost-competitive marine energy technologies and reduces barriers to technology deployment.

Marine Energy Program Activity Area Breakdown

Foundational R&D	Technology-Specific System Design and Validation	Reducing Barriers to Testing
Conduct R&D to drive innovation in components, controls, manufacturing, and materials; develop and validate numerical modeling tools; improve resource assessments and characterizations; develop quantitative metrics to evaluate devices' potential.	Validate performance and reliability of marine energy systems through prototype testing, including in-water testing, for grid-scale, power at sea, and resilient coastal community markets.	Enable access to open-water, grid-connected, and non-grid connected testing facilities; support environmental monitoring technologies, tools, and data collection to understand potential environmental risks and reduce costs.

Data Access. Analytics, and Workforce Development
Improve access to and use of data, tools, and science, technology, engineering, and (STEM) resources to increase awareness of marine energy technology advances and lessons learned; reduce cost, time, and uncertainty for marine energy permitting; and develop a skilled marine energy workforce.

Marine Energy Program Logic Model



Powering the Blue Economy

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 sources for marine renewable energy.

Defining the Blue Economy

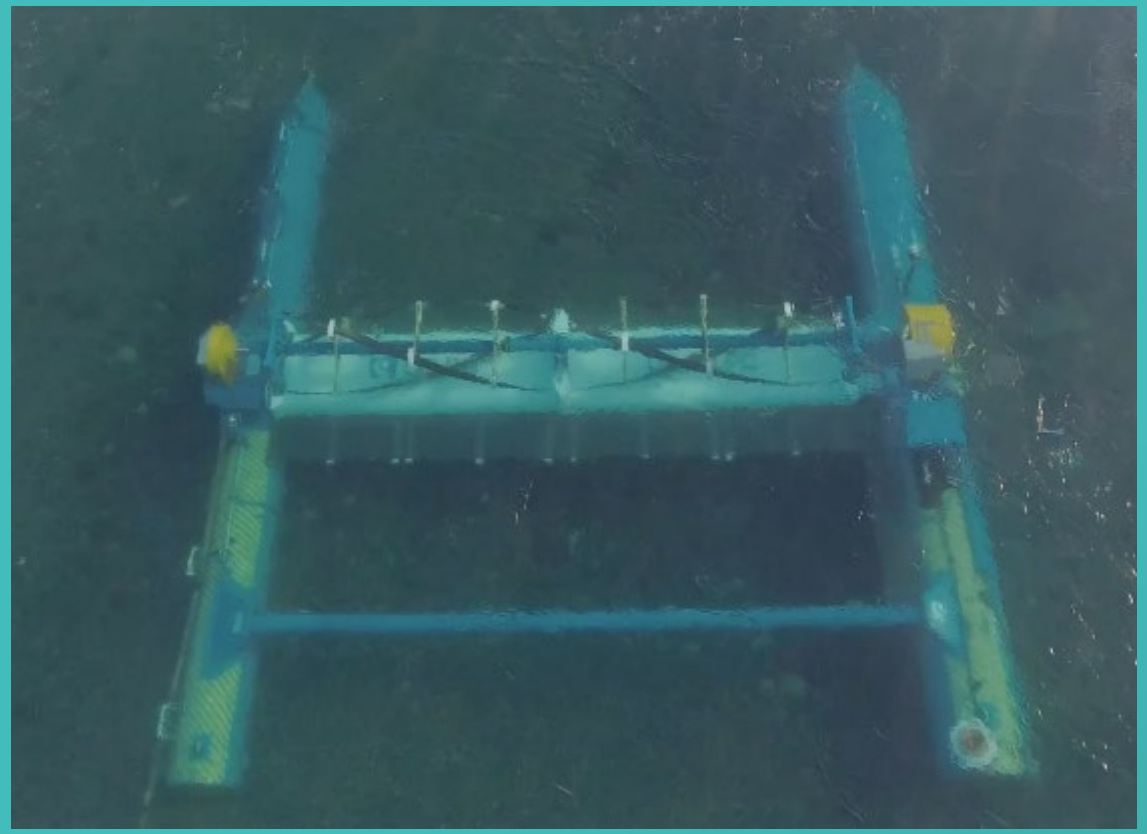
The sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems.

—*The World Bank*

Powering the Blue Economy Funding

WPTO creates a variety of funding mechanisms 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.

Foundational R&D Activity Area



Key Results and Performance Goals (2021–2025):

- Evaluate performance of novel materials for marine energy converter systems.
- Develop power take-off (PTO)/control system co-design methodologies and partner with technology developers to pilot use.
- Validate foundational modeling tools with data from ongoing water testing projects.
- Disseminate data and models through the Marine Energy Atlas and DOE interface to cloud computing services and functional web-based application tools.
- Complete resource measurements and assessments in support of marine energy projects to enhance the resilience of specific remote communities.
- Test component technologies that support significantly improved IO&M.
- Advance power electronics technologies that support integration of marine energy devices into power at sea and coastal community microgrid system applications.

Technology-Specific System Design & Validation Activity Area

Key Results and Performance Goals (2021–2025):

- Complete initial field-testing for modular current energy converter systems that capture river energy in low-flow environments.
- Complete first year-long field tests of wave energy converter device designs in fully energetic wave environments.
- Complete at-sea, pre-commercial demonstrations of marine energy-powered ocean observing and desalination systems.
- Concept refinement, design, and small-scale prototype testing of new wave energy system concepts.
- Establish U.S. capabilities for third-party certification of compliance to IEC Technical Specifications.

Reducing Barriers to Testing Activity Area

Key Results and Performance Goals (2021–2025):

- Complete a minimum of 100 technical support actions under the Testing Expertise and Access for Marine Energy Research (TEAMER) initiative.
- Develop a U.S testing network of at least 30 facilities, including a range of capabilities across traditional marine energy research facilities.
- Identify testing infrastructure gaps address those needs through infrastructure upgrades and development of new capabilities.
- Commission, initiate testing, and gain accreditation for the PacWave grid-connected, open-ocean, wave test facility.
- Demonstrate the improved technical performance of seven environmental monitoring technologies in relevant marine energy environments while collecting environmental data.

Data Access & Analytics Activity Area

Key Results and Performance Goals (2021–2025):

- Publish an assessment of marine energy industry and researcher data needs.
- Collect, analyze, and publish data from in-water testing projects to generate new understanding of marine energy devices.
- Complete integration of publicly available, WPTO-funded, marine energy databases with interconnected search functionality.
- Launch a new marine energy permitting toolkit to improve regulators' access to and information about marine energy resources.
- Release a new marine energy STEM portal consisting of educator and student resources and curricula.
- Improve targeted outreach with the intention of diversifying the pool of students participating in WPTO workforce development programs.

Addressing Program-Level Feedback from 2019 Peer Review

Clearly communicate metrics and goals	• Efforts to re-baseline the current LCOE for marine energy and update our long-term LCOE reduction targets in accordance with the Government Performance and Results Act • Continue to work with domestic and international partners—International Energy Agency-Ocean Energy Systems (IEA-OES) and International Electrical Commission (IEC)—on both metrics and standards
Incorporate detailed design reviews, TEAs, and standards	• More rigorous milestones for go/no-go reviews • Collaboration with IEC Technical Committee 114 to develop technical specifications in order to develop standards for marine energy devices
Incentivize more lab-industry partnership	• TEAMER program brings together capabilities from universities and the national labs to provide developers ready access to unique, world-class testing facilities, expertise, and tools
Disseminate lessons learned	• Marine Energy Council and WPTO's R&D Deep Dive Webinar Series • Annual Accomplishments Report • In-water testing videos

Thank You Marine Energy Reviewers!

Foundational R&D		
David Ingram	**University of Edinburgh**	**Panel Lead**
Deborah Greaves	Supergen Offshore Renewable Energy Hub	Reviewer
Jessie Carman	NOAA, Weather Program Office	Reviewer
Umesh Korde	Johns Hopkins University	Reviewer
Technology-Specific System Design and Validation		
Henry Jeffrey	**University of Edinburgh**	**Program Chair / Panel Lead**
Beth Dickens	Quoceant Ltd.	Reviewer
Claudio Bittencourt Ferreira	DNV Renewables	Reviewer
Sue Molloy	Glas Ocean Electric	Reviewer
Reducing Barriers to Testing		
Sue Barr	**Cambrian Offshore**	**Panel Lead**
Denis Nault	Maine Department of Marine Resources	Reviewer
Louise McGarry	Fundy Ocean Research Centre for Energy	Reviewer
Phil Vitale	Retired (formerly NAVFAC)	Reviewer
Data Access, Analytics, and Workforce Development		
Michael Atkinson	**North Carolina A&T State University**	**Panel Lead**
Ana Couto	European Marine Energy Center	Reviewer
Dan Hasselman	Fundy Ocean Research Centre for Energy	Reviewer
Linda Silverman	Potential Energy DC	*STEM/Workforce Reviewer Only*
Prizes		
Donna Vincent Roa	Vincent Roa Group	*Prize Reviewer Only*
Sally Gutierrez	Environmental Protection Agency	*Prize Reviewer Only*

Questions?