

2.2.5.401 – Ocean Observing Prize



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Project Overview

Project Summary	Project Information
<p>The <i>Powering the Blue Economy™: Ocean Observing Prize</i> is a \$2.4M contest that challenges innovators to develop solutions that <i>integrate marine renewable energy with ocean observation platforms</i> to revolutionize our ability to monitor, manage, and understand the ocean. Competitors are challenged to design, build, and test novel, wave-powered, self-charging autonomous underwater vehicle (AUV) systems that could be suitable for a 6-month deployment in the Atlantic Ocean to monitor hurricane formation.</p>	<p>Principal Investigator(s)</p>
	<ul style="list-style-type: none">PIs: Ben Maurer, NREL and Molly Gear, PNNL
	<p>Project Partners/Subs</p>
	<ul style="list-style-type: none">Partner with NOAA’s Integrated Ocean Observing System (IOOS) OfficeIAA with NSWC CarderockNREL/PNNL prize team: Libby Arnold, Rob Cavagnaro, Rick Driscoll, Jim McNally, Amanda Morton, Erin Walters, and Linnea Weicht.
	<p>Project Status</p>
	<p>Ongoing</p>
	<p>Project Duration</p>
	<ul style="list-style-type: none">November 2019September 2023
	<p>Total Costed (FY19–FY21)</p>
<p>To solve this problem, competitors are working to integrate wave energy capture with AUV systems to collect storm intensity data, helping to better protect coastal communities from oncoming storms.</p>	<p>NREL: \$1,165,381 PNNL: \$901,899</p>

Project Objectives: Relevance

Relevance to Program Goals:

The Ocean Observing Prize contributes to three of WPTO's goals:

- **Foundational R&D**
 - Incentivizes the development and integration of ocean observation and wave energy technologies. The team has reviewed innovations, both in concept and practice, that attempt to address integration and operational challenges to improve device performance in the short term and contribute to Blue Economy growth through ocean monitoring in the long term.
- **Technology-Specific System Design and Validation**
 - Through the BUILD and SPLASH contests, the team will have the opportunity to validate the performance of these systems in both a tank and ocean environment, also contributing to improved device performance and the growth of the Blue Economy through ocean monitoring.
- **Reducing Barriers to Testing**
 - This mechanism enables access to testing facilities, both in a tank and in the ocean, for innovators working on these technologies. While the technology is still early TRL, it will help to more rapidly increase the development life cycle through in-water tests and lowers the barrier to DOE funding for innovators new to wave energy.



Project Objectives: Approach

Approach:

- The Ocean Observing Prize was structured to achieve two primary goals: incentivizing technology development around end-user needs and encouraging engagement from a range of participants.
 - **End-User Requirements:** Before narrowing to a specific ocean observation end use, the team engaged a quality function deployment (QFD) process to better understand energy needs and opportunities for marine energy. The results from the initial QFD analysis and direct engagement with a formal stakeholder advisory group helped shape system requirements.
 - **Engagement:** The team created the public-facing DISCOVER Competition as a first step to encourage engagement from anyone with an idea related to ocean observation that leveraged marine energy. The resulting submissions brought in a variety of ideas, and the team identified the most common areas of interest.
- Following the DISCOVER Competition and the results from end-user engagement, the team launched the DEVELOP Competition, designed to encourage the development of wave-powered, self-charging AUVs for hurricane monitoring.

Project Objectives: Expected Outputs and Intended Outcomes

Outputs:

- This prize aims to support the development of wave-powered, self-charging AUV prototypes for hurricane monitoring. These systems will first be validated and de-risked in a tank test before a planned ocean deployment where the teams will measure their capabilities in the field.
- Commercialization support, software licenses, and one-on-one mentorship are provided for teams throughout the prize by subcontractors and sponsors. Organizations include:
 - New England Ocean Consortium, SeaAhead, Creative Destruction Lab, DS Ocean, Braid Theory, Maritime Blue, Ocean Exchange, and DNV GL.
- Community engagement is planned for the SPLASH Contest, including local K-12 educational events, engagement with the Makah Tribe, and public outreach events featuring the competing teams.

Outcomes:

- Solutions developed through this prize aim to enable long-term collection of data before, during, and after a hurricane that will help better forecast storm intensity.
- Prizes provide an environment to accelerate technology development timelines for innovators. This enables quicker validation of smaller-scale systems for ocean observation and lessons learned that could be applied to the longer-term commercialization of marine energy systems.
- The public focus of prizes helps to improve awareness of marine energy and its ability to provide power to Blue Economy applications. This will be achieved through educational and engagement events during the SPLASH Contest and digital engagement using video features throughout the prize.

Project Timeline

Project Management Strategy

- Weekly team meetings among WPTO, NREL, PNNL (and Carderock later in the project).
- HeroX used for public submissions; Box used for private team files.
- Shift from public to private between DESIGN and BUILD Contests. Down-selected to competitors eligible to test in the tank.
- Schedule modified at end of FY21 to allow for more development time considering pandemic-related challenges.

Go/No Go Timeline

- **March 2020:** Determine viability of BUILD Contest based on quality of submissions in DESIGN Contest.
- **June 2022:** Determine viability of the SPLASH Contest based on prepared teams at conclusion of BUILD Contest.

FY 2019

Perform QFD analysis to evaluate power needs for ocean observing systems.

Engage end-user community to identify minimum system requirements.

FY 2020

Launch DISCOVER Competition to evaluate a range of potential concepts and award winners.

Using inputs from end user engagement and DISCOVER Competition, **create and launch the DEVELOP Competition: DESIGN Contest** on hurricane monitoring.

FY 2021

Award DESIGN Contest winners eligible to test in Carderock and develop and launch BUILD Contest.

Provide commercialization support for BUILD Contest teams.

Execute IAA with Carderock and prepare for tank test.

Project Budget

Total Project Budget – Award Information		
DOE (distributed to labs)	IAA – U.S. Navy	Total
\$5,012,000	\$440,000	\$5,452,000

FY19	FY20	FY21	Total Actual Costs FY19–FY21
Costed	Costed	Costed	Total Costed
NREL: \$25,647	NREL: \$380,790 PNNL: \$361,683	NREL: \$758,944 PNNL: \$540,216	NREL: \$1,165,381 PNNL: \$901,899 Total: \$2,067,280

- Of the total project budget planned through FY23, \$2.4M will be distributed as awards to the teams.
- Remainder of the funds are planned to support the SPLASH Contest in FY23.
- The schedule has been modified to account for challenges in facility access and supply chain delays due to the pandemic. An additional \$120k was distributed to the teams in FY22 to supplement their development efforts; this was covered through reallocated, unused travel funds.
- Modifications have been initiated to reflect the new timeline, but the original budget and project scope is still on track.

End-User Engagement and Dissemination

- **QFD analysis** on opportunities to integrate marine energy with ocean observing systems
 - QFD analysis to better understand needs/opportunities for marine energy. Determined ocean observation missions could use additional power. Developed interagency partnership with NOAA's IOOS Office.
 - In FY21, team published conference paper, "Research and Development Pathways for Powering the Blue Economy with Marine Renewable Energy" to highlight link between prizes and R&D.
- **Rules workshops** for the DISCOVER and DEVELOP Competitions
 - Before launching, the team hosted public rules workshops to invite comments from end users and entrepreneurs. Feedback informed competitor and minimum system requirements.
- **Public-facing contests** with a low barrier to entry
 - DISCOVER Competition: 61 applications; 7/11 awardees new to WPTO.
 - DEVELOP Competition – DESIGN Contest: 16 applications, 4/7 awardees new to WPTO.
- **Outreach strategy** to attract entrepreneurs with marine energy and marine robotics expertise.
 - Leveraged WPTO, NREL, and PNNL channels to recruit competitors.
 - Worked with partners to expand applicant pool beyond WPTO's existing network, targeting organizations with networks of entrepreneurs and universities that may have applicable experience.
- **Long-term benefits** through the advancement of the technology that will help:
 - NOAA and other end users of ocean observing systems to improve their forecasting technologies.
 - Better protect coastal communities from the impacts of hurricanes.
 - Inform marine energy deployment processes for future WPTO projects.

Performance: Accomplishments and Progress

- Confirmation of energy needs for ocean observation systems to collect additional data in the ocean and marine energy's role as a co-located energy resource to fill that gap through a rigorous analytical process.
- Strengthening ties between marine energy and ocean observation communities across agencies and in private sector.
 - Measured ability to encourage new entrepreneurs and university researchers that have not received WPTO funding to explore potential to integrate marine energy with ocean observation systems.
- Three teams, incentivized to develop wave-powered, self-charging AUVs, testing systems in Carderock wave basin June 2022.
 - Team success measured, categorized, and weighted by data teams can collect, system maneuverability, and power generation capacity.
 - Technology development contributing to long-term performance of marine energy and advancement of marine energy's role in the Blue Economy.



Future Work

- Next Steps for the Ocean Observing Prize
 - BUILD Contest concluding in June 2022
 - Three systems to be tested in the Carderock wave basin to validate their mission readiness.
 - Outcomes from contest and performance of teams will inform system requirements, evaluation metrics, and viability of SPLASH. If viable, rules document will be developed and released in Q4 FY22.
 - Planned Go/No Go at end of BUILD to determine if systems are ready to be deployed at sea. Scope, timeline, and budget have been allocated at NREL and PNNL assuming this deployment.
 - SPLASH Contest concluding in April 2023
 - Teams selected to continue will deploy at sea in Clallam Bay, Washington, and compete for \$1.5M prize pool.
 - Depending on outcome of SPLASH, WPTO intends to provide follow-on funding for OOP 1.0 participants
 - Planning for Ocean Observing Prize 2.0
 - Following results of BUILD , the team will host end-user workshop to determine changes to the mission space and system requirements to potentially develop another prize under the Ocean Observing Prize umbrella.
- Future work to power ocean observing equipment with marine energy
 - WPTO working with WHOI on a project for Coastal Pioneer Array, a network of oceanographic moorings, gliders, and AUVs located off coast of Martha's Vineyard. Array will be recovered, refurbished, then moved to Mid-Atlantic Bight off coast of North Carolina in 2024.
 - Team will collaborate with WHOI to conceptualize, design, build, and test small electricity producing WEC test article to augment solar and wind energy powering the buoy
 - Project currently being competed at laboratories, and specifics on scope, timeline, and budget will be determined as team is finalized.