
Powering the Blue Economy™
OCEAN OBSERVING
PRIZE
AMERICAN MADE WATER PRIZE
U.S. DEPARTMENT OF ENERGY
NOAA
SPLASH-C
CONTEST
Official Rules Document
September 2022

Preface

The U.S. Department of Energy's Ocean Observing Prize will be governed by this Official Rules document, which establishes the prize rules and requirements for the SPLASH-C Contest.

The Pacific Northwest National Laboratory and the National Renewable Energy Laboratory are supporting the U.S. Department of Energy and the National Oceanic and Atmospheric Administration on the development and administration of this prize.

The Prize Administrators reserve the right to modify this Official Rules document if necessary and will publicly post any such notification as well as notify registered competitors.

Table of Contents

Preface 1
Table of Contents 2
List of Figures 2
Acronym List 2
1. Introduction 3
    1.1. SPLASH-C Contest Summary 3
2. Ocean Observing Prize Overview 4
    2.1. Mission Space 5
    2.2. Competition Objectives 6
3. SPLASH-C Contest 7
    3.1. Background 7
    3.2. Awards 8
    3.3. TEAMER Application Process 8
    3.4. Additional Optional National Laboratory Support 9
    3.5. Prizes 10
    3.6. Competition Logistics 10
    3.7. COVID-19 Contingencies 11
    3.8. SPLASH-C Eligibility Requirements 11
Appendix A. Additional Terms and Conditions 12
Appendix B. Relevant Mission Space 18
Appendix C. Summary of TEAMER Rules 21

List of Figures

Figure 1. Ocean Observing Prize timeline 4
Figure 2. Major Atlantic hurricane tracks for the past decade 18

Acronym List

AUV	autonomous underwater vehicle
DOE	U.S. Department of Energy
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NREL	National Renewable Energy Laboratory
RFTS	Request for Technical Support
TEAMER	Testing Expertise and Access for Marine Energy Research
TSR	technical support recipient

1. Introduction

This prize program challenges innovators to integrate marine renewable energy with ocean observation platforms, revolutionizing our ability to collect the data needed to understand, map, and monitor the ocean.

This joint prize between the Water Power Technologies Office at the U.S. Department of Energy (DOE) and the U.S. Integrated Ocean Observing System program at the National Oceanic and Atmospheric Administration (NOAA) seeks to develop new technologies to fill the data gaps that make it difficult to realize the full potential of the blue economy.

The SPLASH-Customized (SPLASH-C) Contest is the last contest in the Ocean Observing Prize: DEVELOP Competition. In this competition, teams compete for cash awards through three contests in which they design, build, and test innovative, functionally viable prototype systems suitable for hurricane monitoring that incorporate wave energy harvesting for self-charging of autonomous underwater vehicles (AUVs). Prototypes emerging from this competition are not meant to be mature systems but should demonstrate basic functionality and the potential for refinement into a commercially viable product.

As described in this document, the SPLASH-C Contest invites the winners of the BUILD Contest to consider the results from their tests in the prior contest and identify the most beneficial support. Successful teams will receive additional cash prizes for carrying out this progression.

1.1. SPLASH-C Contest Summary

The SPLASH-C Contest is designed to provide a pathway for continued technology development for the BUILD Contest winners with a focus on direct laboratory mentorship for competitors, a testing campaign customized to competitor needs, and a final cash prize for each competitor that successfully leverages that mentorship and completes their testing.

Teams will have access to a network of testing facilities through Testing Expertise and Access for Marine Energy Research (TEAMER), a program sponsored by the U.S. Department of Energy Water Power Technologies Office, to ensure testing is aligned with competitor needs. Teams will complete a program application, called a Request for Technical Support (RFTS) to access this network of facilities. Only those teams selected to receive support through this review process will be able to compete in the SPLASH-C Contest. Selected teams that successfully complete their TEAMER testing campaign will be evaluated to receive the cash prize.

This document outlines the official rules for the SPLASH-C Contest. $150,000 will be split evenly among up to three winning teams at the end of the SPLASH-C Contest.

SPLASH-C Contest Key Dates

All dates are subject to change, and the most updated timeline is available on the HeroX website.

- TEAMER RFTS open through November 4, 2022
- TEAMER access period: February 2023–November 2023
- Final submissions for SPLASH-C due: January 2024
- Anticipated award announcement: February 2024.

2. Ocean Observing Prize Overview

The goals of the Ocean Observing Prize are to:

- Enable collection of valuable new data. Proposed innovations should increase the spatial coverage, temporal resolution, and/or types of ocean and atmospheric variables that can be observed, collected, processed, and transmitted, leading to improved understanding, monitoring, and management of the ocean.
- Generate sufficient power from co-located marine resources. Solutions must be able to generate sufficient power to meet the energy needs of end users from the ocean observing community and prove the viability of marine energy to power ocean observing.
- Accelerate commercialization of marine energy systems. Traditional development timelines of marine energy devices for the electrical grid can take many years to design, build, and test. By working at smaller scales and addressing ocean observing system energy needs, marine energy may find a faster path to commercialization.
- Grow a diverse community of innovators. This prize will help bring new innovators into the marine energy and ocean observing space. It will also encourage new partnerships and collaborations among industry, academia, and government to create innovative ocean observing technologies powered by marine energy.

The DEVELOP competition comprises three separate contests: DESIGN (closed), BUILD (closed), and SPLASH-C.

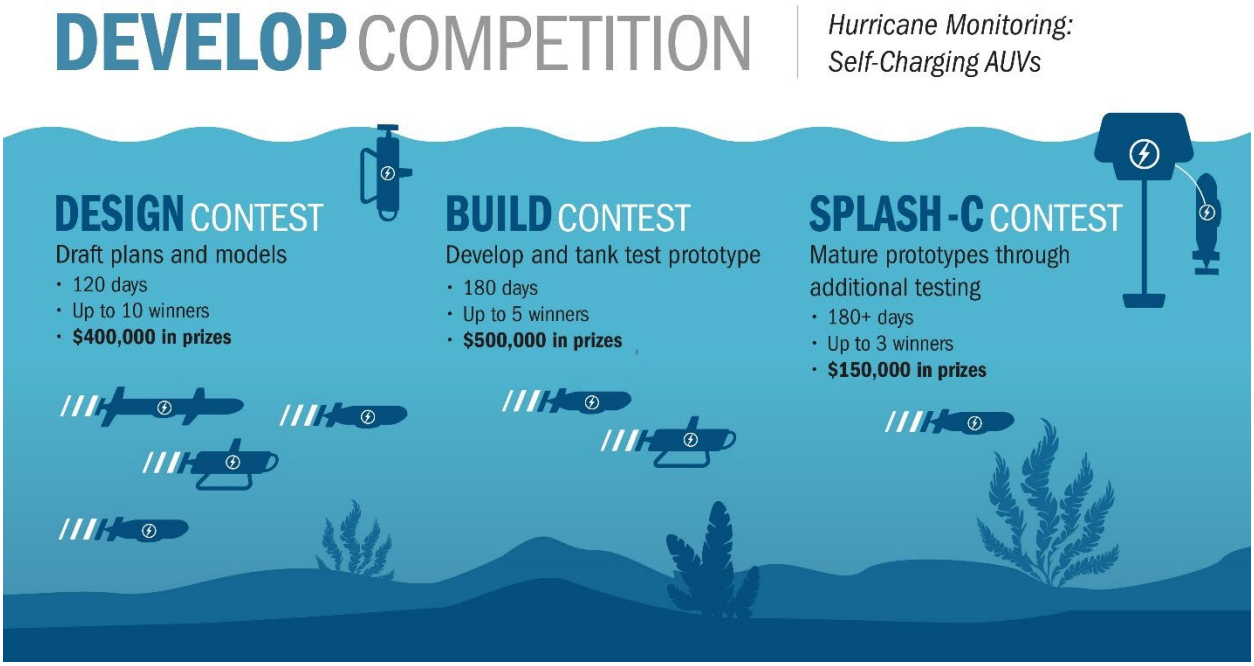

Figure 1. Ocean Observing Prize timeline

2.1. Mission Space

The technologies used for ocean observing are numerous and vary significantly in terms of function, size, cost, and power consumption. Examples include autonomous underwater vehicles, buoyancy gliders, profiling floats, weather and drifter buoys, and electronic tags on marine animals. Nearly all these systems rely on batteries, but batteries are by definition temporary energy sources and must be periodically recharged or replaced. For systems that are operating far offshore or deep underwater for sustained periods, recharging a battery becomes a challenging and costly endeavor.

These energy limitations force ocean scientists to make tough choices with respect to what sensors they can host on a platform, how much data they can collect, how often they can communicate with the system or relay the data back to shore, and how often they must visit it once deployed.

The Ocean Observing Prize aims to incentivize new solutions that integrate marine energy with ocean observing instruments, platforms, and systems that reduce or eliminate the energy constraints hindering our ability to effectively monitor and manage the ocean. Improved ocean observations fueled by marine energy sources can promote growth in the blue economy and help us better understand the ocean and its value to humankind.

> *"While modern AUVs are able to operate autonomously when on-mission and underwater, they still rely on manual intervention by a support vessel between individual missions…in situ recharging represents the next major evolution in subsea robotic capabilities. With these capabilities, future AUV systems will be able to reside at sites of interest for durations greater than a single mission, becoming Resident AUV (RAUV) systems."*[1]

Within the theme of buoys and autonomous systems, there are many different ocean observing platforms serving a wide variety of missions. Interviews with ocean scientists highlighted a clear need to address the energy limitation of AUVs.

AUVs come in many different shapes and sizes and are used for numerous purposes, including subsea pipeline inspections, seafloor mapping, and fish tracking. Like electric cars, these systems are limited in range and duration by the capacity of their energy storage systems. Unfortunately, replenishing energy storage systems on AUVs at sea is far more difficult and costly than recharging electric cars. This energy limitation constrains AUV missions. If an AUV had access to a reliable source of energy for self-charging without the need for human intervention, it would change this paradigm and help enable resident AUVs.

According to interviews with ocean scientists, a self-charging AUV would be a game-changer for a number of applications and missions, one of which is closing an important data gap in hurricane monitoring. The DEVELOP Competition is structured around this real-world need.

To better support current technology readiness, the mission space for SPLASH-C has shifted to remove expectations of autonomy and at-sea deployments for the competitors and enabled teams to request the support most beneficial to their specific technology.

---

[1] D. Manalang, J. Delaney, A. Marburg and A. Nawaz. 2018. "Resident AUV Workshop 2018: Applications and a Path Forward." Presented at the 2018 IEEE/OES Autonomous Underwater Vehicle Workshop (AUV), Porto, Portugal, 6–9 November 2018, doi: 10.1109/AUV.2018.8729720.

2.2. Competition Objectives

The original objective of the competition is to spur innovative designs that integrate wave energy harvesting with autonomous underwater vehicles. These designs could help ocean observing systems become more self-sufficient and create a missing but necessary capability in resident autonomous vehicles. A secondary objective of this competition is community building. Through cash awards and other incentives, the prize aims to bring together a diverse community of ocean scientists, roboticists, marine energy technologists, and others to create an environment ripe for creative solutions.

In alignment with these objectives, the competition attempts to bring together diverse, multidisciplinary teams to design, build, and test innovative, functionally viable systems that incorporate wave energy harvesting for the self-charging of AUVs. Prototypes emerging from this competition are not meant to be fully mature systems but should demonstrate basic functionality and the potential for refinement into a commercially viable product that addresses a real-world challenge such as hurricane monitoring, as outlined in detail in Appendix B.

Each of the three contests in the competition is structured to help teams rapidly design and prototype their ideas while competing for cash prizes and other awards. After the completion of the BUILD Contest, The Water Power Technologies Office and Prize Administrators determined that additional support mechanisms would benefit the teams. They have adjusted the expectations of the original SPLASH Contest accordingly, and it is now called SPLASH-C.

2.2.1. DESIGN Contest (CLOSED): Seven Winners, $400,000 in Prizes

The DESIGN Contest, now concluded, tasked competitors to design systems that use ocean surface waves as an energy source for recharging AUVs at sea for the purpose of monitoring hurricanes in the Atlantic Ocean. From the opening date, competitors had approximately 3 months to design systems that met the requirements as laid out in the DESIGN Contest Rules Document.

Submissions to the DESIGN Contest were reviewed by a panel of experts in wave energy, marine robotics, and ocean science to assess the potential of the designs. Seven awards totaling $400,000 were made to high-scoring submissions to the DESIGN Contest. Only the seven selected competing teams were eligible to participate in the BUILD Contest, where they were tasked with building and testing their prototype designs in the controlled environment of a test facility.

2.2.2. BUILD Contest (CLOSED): Three Winners, $500,000 in Cash Prizes

Following the DESIGN Contest, the BUILD Contest provided participating teams with the opportunity to build their early-stage experimental prototypes and test them in the Maneuvering and Seakeeping Basin—also known as the U.S. Navy's indoor ocean—located at the Naval Surface Warfare Center's facility in Carderock, Maryland.

During the testing portion of the BUILD Contest, teams assembled and prepared their experimental ocean observing devices, completing a dry and wet check to ensure the devices were safe and ready to go in the water. After each device cleared the checks, the crew placed the prototypes one at a time in the test tank. Each prototype weathered a variety of wave conditions and had the opportunity to demonstrate its capabilities through a data-collecting maneuvering mission and a wave-powered recharging session.

Experts evaluated each wave-powered prototype in four categories, including data, maneuverability, power, and mission compliance (like operations, safety, size, and weight). While this technology is still in the early stages of development, these first-generation prototypes not only met testing expectations but also helped identify future research opportunities for marine-energy-powered ocean observing platforms. Only the three selected winners in the BUILD Contest are eligible to participate in the SPLASH-C Contest.

2.2.3. SPLASH-C Contest: Up to Three Winners, $150,000 Cash Prize Split Evenly

The DEVELOP Competition will conclude with the SPLASH-C Contest, which will enable teams to customize the next stage of their technology development to their specific needs. Opportunities for support include:

1. Testing through the TEAMER program, valued at up to $150,000 per team
2. Laboratory mentorship (optional)
3. $150,000 cash prize, split evenly among winners.

Each element of the SPLASH-C Contest will build on the previous element. The contest will begin with competitors applying to the TEAMER program, described in the following section. Competitors accepted into the TEAMER program will be able to request customized mentorship support from laboratory staff to continue their development. Specific details are noted on the process in Section 3. Only those selected to receive support through the TEAMER review process will be able to compete in the SPLASH-C Contest.

SPLASH-C Contest Anticipated Key Dates

- TEAMER RFTS open through October 14, 2022
- TEAMER access period: February 2023–November 2023
- Final submissions for SPLASH-C due: January 2024
- Anticipated award announcement: February 2024

All dates are subject to change, and the most updated timeline is available on the HeroX website.

3. SPLASH-C Contest

3.1. Background

The SPLASH-C Contest invites BUILD Contest prize winners to continue maturing their concept through additional testing. Participants will first apply to the TEAMER program. If a participant is successfully accepted into the TEAMER program—which has a separate review process that the Prize Administrators will not be involved with—the Prize Administrators will be available to provide technical advice and insight leading up to, during, and immediately following the test. Support from the Prize Administrators is optional.

The SPLASH-C Contest invites BUILD Contest prize winners to tailor their next test with a testing facility most appropriate for their technology development and to receive optional mentoring from laboratory experts that aligns with their needs.

To meet contest requirements, competitors must complete the following steps:

- Apply to the TEAMER program by submitting an RFTS (request for technical support)

- Receive technical assistance for their TEAMER test through this third-party review process, with facility support worth up to $150,000 per team
- Submit a request for laboratory mentorship in coordination with TEAMER support (optional)
- Submit a post-access test report, following the TEAMER template, on the completed testing and data collection, which can be found at https://teamer-us.org/test-plan-post-access-report-template/.

It is DOE's intent to prevent the release of submission materials to the public. DOE will make a reasonable effort to protect submission materials from public disclosure. Please see the section on the Freedom of Information Act in Appendix A for more info.

3.2. Awards

Following the competition, the Prize Administrators and reviewers will confer to evaluate the post-access test report and data collection required by the TEAMER test. Winning teams will equally split a prize purse of $150,000. The Prize Administrators will notify prize awardees via email and request the necessary information to distribute cash prizes. The Prize Administrators and DOE will publicly announce awardees.

3.3. TEAMER Application Process

The Testing Expertise and Access for Marine Energy Research (TEAMER) program, sponsored by DOE and directed by the Pacific Ocean Energy Trust, runs annual open funding calls to support developers seeking access to the nation's best facilities and expertise. TEAMER facilitates the distribution of this support funding to testing facilities through competitive opportunities (known as Requests for Technical Support, RFTS) to support marine renewable energy testing and development projects, distributed to testing facilities.

The TEAMER Facility Networks represent the top tier of marine energy testing and expertise facilities in the United States. All facilities listed on the TEAMER facility pages have been approved by the TEAMER Technical Board and are able to provide testing or expertise to TEAMER applicants. Types of testing available through TEAMER include numerical modeling and analysis; laboratory and bench testing; tank, flume, tunnel, and basin testing; and open water testing. Ocean Observing Prize participants are encouraged to select a test facility that will be most impactful in maturing their concept. There is no preference from the Prize Administrators for which kind of test a competitor selects.

A TEAMER RFTS is a collaboration between the technology developer or researcher, and the facility chosen to help meet the recipient's technical objectives. Prior to applying for support, recipients are required to have discussed their technical objectives with the facility to ensure the facility has the capability to assist and provide the necessary support. Only approved test facilities are eligible to provide technical support.

Applications are completed online at https://teamer-us.org/application/, or they can be found on the "Apply Now" page under the "Apply" tab on the TEAMER website. Applications for RFTS 8 (where the "8" refers to Access Period 8) are due on November 4, 2022. Ocean Observing Prize applicants wishing to utilize the additional support during the SPLASH-C Contest must apply to RFTS 8, though future RFTS calls are always open for any interested party. The dates for each RFTS application and period of performance can be found on the "Apply Now" page as well.

Applications are reviewed by a minimum of three external reviewers, coordinated by the TEAMER Network Director. Final RFTS recommendations are then made by the TEAMER Technical Board. Applications are reviewed using the criteria found at https://teamer-us.org/wp-content/uploads/2022/06/TEAMER-RFTS-Evaluation-Criteria-1.pdf.

Applicants may only apply for assistance in one category (numerical modeling and analysis, bench/lab testing, tank/flume testing, open water activities) per RFTS. Multiple facility applications are permitted but must demonstrate coordination between facilities to accomplish the RFTS.

The final report template, which is a required component to win the cash award, can be found at https://teamer-us.org/test-plan-post-access-report-template/.

An additional summary of TEAMER Program Rules is available in Appendix C.

3.4. Additional Optional National Laboratory Support

Upon successful acceptance into the TEAMER program, SPLASH-C competitors can request support from national laboratory staff from PNNL and/or NREL in the form of technical advice and insight leading up to, during, and immediately following the TEAMER test. The intent of this support is to maximize the likelihood of successful testing within the TEAMER network.

All support provided is in terms of person-time and travel of national laboratory staff only and does not, for example, cover the procurement of equipment or access to equipment beyond what is received through the TEAMER network.

Contestants should request support directly from the Prize Administrators by email at OceanObserving@nrel.gov after acceptance into TEAMER.

The support may be in the form of one or more of the following but is not limited to:

- Systems engineering
- Test plan design
- Device numerical modeling
- Device engineering
- Component selection
- Controls optimization
- Instrumentation selection
- On-site technical support
- Data processing and analysis.

Support may be provided in the window immediately following acceptance to the TEAMER program and up to 60 days following the completion of testing at a TEAMER site.

This laboratory support is in addition to the in-kind support valued at up to $150,000 provided directly through the TEAMER program, whether or not the competitor chooses TEAMER support from NREL or PNNL. Support will be provided to all competitors, and the value of the national laboratory support is estimated to be 75 person-hours total per competitor.

TEAMER requires the sharing of data generated during the TEAMER test, as described in Appendix C. Competitors will maintain ownership of their intellectual property.

3.5. Prizes

Scoring

The post-access test report in the Ocean Observing Prize: SPLASH-C Contest will be scored using the following 1–6 scale:

1	2	3	4	5	6
Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree

Submissions for the post-access test report submitted after the TEAMER testing campaign will be evaluated against the following criteria. The submission template is available at https://teamer-us.org/test-plan-post-access-report-template/.

SPLASH-C Contest Final Report Evaluation Criteria	
Suggested Content Provided by Competitor • TEAMER test plan and post-access test report using the required TEAMER template • Any agreements with the TEAMER facility • Evidence of engagement with laboratory staff to receive mentorship in alignment with test plan and/or evidence of utilizing an appropriate TEAMER facility • Any data collected through the testing process on the device performance.	**Each Statement Scored on 1–6 Scale** • The competitor has demonstrated completion of the work proposed in the TEAMER application, with or without modification, and has included a complete Test Plan and Post-Access Report following the TEAMER template. • The competitor has leveraged mentorship opportunities and/or TEAMER facility access to contribute to the advancement of their technology. • The competitor provided relevant data collected during the testing process, analyzed appropriately and/or provided visualizations.

The judge will be the director of DOE's Water Power Technologies Office. The judge will consider the reviewers' scores and any relevant program policy factors and make the ultimate determination for awards. The $150,000 cash prize purse will be split evenly among winning competitors.

Awards will be reported to the participants in the weeks following the contest.

REVIEWER SCORES AND JUDGING DECISIONS ARE FINAL AND THERE IS NO PROCESS FOR APPEAL.

3.6. Competition Logistics

Timeline of Competition

- TEAMER RFTS open through November 4, 2022

- TEAMER Access period: February 2023–November 2023
- Final submissions for SPLASH-C due: January 2024
- Anticipated award announcement: February 2024.

All dates are subject to change, and the most updated timeline is available on the HeroX website.

3.7. COVID-19 Contingencies

In light of the ongoing pandemic, the Prize Administrators reserve the right to alter test plans and dates to comply with facility health and safety requirements and travel restrictions.

3.8. SPLASH-C Eligibility Requirements

The competition is open only to winning teams of the Ocean Observing Prize BUILD Contest as named by DOE.

DOE employees, employees of sponsoring organizations, members of their immediate families (i.e., spouses, children, siblings, or parents), and persons living in the same household as such persons, whether or not related, are not eligible to participate in the prize. Federal entities and federal employees, acting within the scope of their employment, are also not eligible to participate in any portion of the prize. DOE national laboratory employees cannot compete in any stage of the prize. Individuals working under a competing entity may participate if they are legally allowed to work in the United States.

BEST OF LUCK TO ALL COMPETITORS!

Appendix A. Additional Terms and Conditions

Universal Contest Requirements

Your submissions are subject to following terms and conditions:

- You must upload the final content of your submission by the dates noted in Section 1 to HeroX. Any other form of submission will not be accepted. Late submissions will not be accepted.
- The post-access test report is not intended to be made public, however, see Additional Terms & Conditions regarding the Records Retention and Freedom of Information Act.
- You must include all the required submission's elements. The Prize Administrators may disqualify your submission after an initial screening if you fail to provide all required submission elements. Competitors may be given an opportunity to rectify submission errors due to technical challenges or to fix non-substantive mistakes or errors in their submission packages.
- Your submission must be in English and in a format readable by Microsoft Word or a PDF viewer. Handwritten submissions will be disqualified.
- Submissions and competitors will be disqualified if any engagement with the Ocean Observing Prize—included but not limited to the submission, the HeroX forum, or emails to the Prize Administrators—contains any matter that, in the sole discretion of DOE or NREL, is indecent, obscene, defamatory, libelous, lacking in professionalism, or demonstrates a lack of respect for people or life on this planet.
- If you click "Accept" on the HeroX platform and register for any of the contests described in this document, you are agreeing to be bound by these rules in addition to the existing HeroX Terms of Use for all purposes relating to these contests. You should print and keep a copy of these rules. These provisions apply only to the contests described here and no other contests on the HeroX platform or anywhere else.
- As part of your submission to this prize program, you will be required to sign the following statement:

  I am providing this submission package as part of my participation in this prize. I understand that I am providing this submission to the Federal Government. I certify under penalty of perjury that the named competitor meets the eligibility requirements for this prize competition and complies with all other rules contained in the Official Rules document. I further represent that the information contained in the submission is true and contains no misrepresentations. I understand false statements or misrepresentations to the Federal Government may result in civil and/or criminal penalties under 18 U.S.C. § 1001 and § 287

Verification for Payments

The Prize Administrators will verify the identity and role of all competitors before distributing any prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrators will notify winning competitors using provided email contact information for the individual or entity that was responsible for the submission. Each competitor will be required to sign and return to the Prize Administrators, within 30 days of the date on the notice, a completed NREL Request for ACH Banking Information form and a completed W-9 form (https://www.irs.gov/pub/irs-pdf/fw9.pdf). In the sole discretion of the Prize Administrators, a winning competitor will be disqualified from the competition and receive no prize funds if: (i) the person/entity does not respond to notifications; (ii) the person/entity fails to sign and return the required documentation within the required time period; (iii) the notification is

returned as undeliverable; (iv) the submission or person/entity is disqualified for any other reason as specified in eligibility Section I.5 or universal content Section VI.1.

In the event of a dispute as to any registration, the authorized account holder of the email address used to register will be deemed to be the competitor. The "authorized account holder" is the natural person or legal entity assigned an email address by an internet access provider, online service provider, or other organization responsible for assigning email addresses for the domain associated with the submitted address. All competitors may be required to show proof of being the authorized account holder.

Teams and Single-Entity Awards

The Prize Administrators will award a single dollar amount to the designated primary submitter, whether consisting of a single or multiple entities. The primary submitter is solely responsible for allocating any prize funds among its member competitors or teammates as they deem appropriate. The Prize Administrators will not arbitrate, intervene, advise on, or resolve any matters or disputes between team members or competitors.

Submission Rights

By making a submission and consenting to the rules of the contest, a competitor is granting to DOE, the Prize Administrators, and any other third parties supporting DOE in the contest, a license to display publicly and use the parts of the submission that are designated as "public" for government purposes. This license includes posting or linking to the public portions of the submission on the Prize Administrators or HeroX applications, including the contest website, DOE websites, and partner websites, and the inclusion of the submission in any other media worldwide. The submission may be viewed by the DOE, Prize Administrators, and judges and reviewers for purposes of the contests, including but not limited to screening and evaluation purposes. The Prize Administrators and any third parties acting on their behalf will also have the right to publicize competitors' names and, as applicable, the names of competitors' team members and organization, which participated in the submission on the contest website indefinitely.

By entering, the competitor represents and warrants that:

1. Competitor's entire submission is an original work by competitor and competitor has not included third-party content (such as writing, text, graphics, artwork, logos, photographs, likeness of any third party, musical recordings, clips of videos, television programs or motion pictures) in or in connection with the submission, unless (i) otherwise requested by the Prize Administrators and/or disclosed by competitor in the submission, and (ii) competitor has either obtained the rights to use such third-party content or the content of the submission is considered in the public domain without any limitations on use.
2. Unless otherwise disclosed in the submission, the use thereof by Prize Administrators, or the exercise by Prize Administrators of any of the rights granted by competitor under these rules, does not and will not infringe or violate any rights of any third party or entity, including, without limitation, patent, copyright, trademark, trade secret, defamation, privacy, publicity, false light, misappropriation, intentional or negligent infliction of emotional distress, confidentiality, or any contractual or other rights;
3. All persons who were engaged by the competitor to work on the submission or who appear in the submission in any manner have:

a) Given the competitor their express written consent to submit the submission for exhibition and other exploitation in any manner and in any and all media, whether now existing or hereafter discovered, throughout the world;
b) Provided written permission to include their name, image, or pictures in or with the submission (or, if a minor who is not competitor's child, competitor must have the permission of the minor's parent or legal guardian) and the competitor may be asked by the Prize Administrators to provide permission in writing;
c) Not been and are not currently under any union or guild agreement that results in any ongoing obligations resulting from the use, exhibition, or other exploitation of the submission.

Copyright

Each competitor represents and warrants that the competitor is the sole author and copyright owner of the submission; that the submission is an original work of the competitor or that the competitor has acquired sufficient rights to use and to authorize others, including DOE, to use the submission, as specified throughout the rules; that the submission does not infringe upon any copyright or any other third-party rights of which the competitor is aware; and that the submission is free of malware.

Contest Subject to Applicable Law

All contests are subject to all applicable federal laws and regulations. Participation constitutes each participant's full and unconditional agreement to these Official Contest Rules and administrative decisions, which are final and binding in all matters related to the contest. This notice is not an obligation of funds; the final award is contingent upon the availability of appropriations.

Resolution of Disputes

The U.S. Department of Energy is solely responsible for administrative decisions, which are final and binding in all matters related to the contest.

Neither the U.S. Department of Energy nor the Prize Administrators will arbitrate, intervene, advise on, or resolve any matters between team members or among competitors.

Publicity

The winners of these prizes (collectively, "winners") will be featured on DOE and NREL websites.

Except where prohibited, participation in the contest constitutes each winner's consent to DOE's and its agents' use of each winner's name, likeness, photograph, voice, opinions, and/or hometown and state information for promotional purposes through any form of media worldwide, without further permission, payment, or consideration.

Liability

Upon registration, all participants agree to assume any and all risks of injury or loss in connection with or in any way arising from participation in this contest. Upon registration, except in the case of willful misconduct, all participants agree to and, thereby, do waive and release any and all claims or causes of action against the federal government and its officers, employees, and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential, and whether foreseeable or not), arising from their participation in the contest, whether the claim or cause of action arises under contract or tort.

In accordance with the delegation of authority to run this contest delegated to the director of the Water Power Technologies Office, the director has determined that no liability insurance naming DOE as an insured will be required of competitors to compete in this competition per 15 USC 3719(i)(2). Competitors should assess the risks associated with their proposed activities and adequately insure themselves against possible losses.

Records Retention and Freedom of Information Act

All materials submitted to DOE as part of a submission become DOE records and are subject to the Freedom of Information Act. The following applies only to portions of the submission not designated as public information in the instructions for submission. If a submission includes trade secrets or information that is commercial or financial, or information that is confidential or privileged, it is furnished to the Government in confidence with the understanding that the information shall be used or disclosed only for evaluation of the application. Such information will be withheld from public disclosure to the extent permitted by law, including the Freedom of Information Act. Without assuming any liability for inadvertent disclosure, DOE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for review of the application or as otherwise authorized by law. This restriction does not limit the Government's right to use the information if it is obtained from another source.

Submissions containing confidential, proprietary, or privileged information must be marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

The submission must be marked as follows and identify the specific pages containing trade secrets, confidential, proprietary, or privileged information:

> Notice of Restriction on Disclosure and Use of Data:
>
> Pages [list applicable pages] of this document may contain trade secrets, confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes. [End of Notice]

The header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Trade Secrets, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure." In addition, each line or paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets.

Competitors will be notified of any Freedom of Information Act requests for their submissions in accordance with 29 C.F.R. § 70.26. Competitors may then have the opportunity to review materials and work with a FOIA representative prior to the release of materials.

Privacy

If you choose to provide HeroX with personal information by registering or completing the submission package through the contest website, you understand that such information will be transmitted to DOE and may be kept in a system of records. Such information will be used only to respond to you in matters regarding your submission and/or the contest unless you choose to receive updates or notifications about other contests or programs from DOE on an opt-in basis. DOE and NREL are not collecting any information for commercial marketing.

General Conditions

DOE reserves the right to cancel, suspend, and/or modify the contest, or any part of it, at any time. If any fraud, technical failures, or any other factor beyond DOE's reasonable control impairs the integrity or proper functioning of the contests, as determined by DOE in its sole discretion, DOE may cancel the contest.

Although DOE may indicate that it will select up to several winners for each contest, DOE reserves the right to only select competitors that are likely to achieve the goals of the program. If, in DOE's determination, no competitors are likely to achieve the goals of the program, DOE will select no competitors to be winners and will award no prize money.

Program Policy Factors

While the scores of the expert reviewers will be carefully considered, it is the role of the prize judge to maximize the impact of contest funds. Some factors outside the control of competitors and beyond the independent expert reviewer scope of review may need to be considered to accomplish this goal. The following is a list of such factors. In addition to the reviewers' scores, the below program policy factors may be considered in determining winners:

- The degree to which the proposed project incorporates diversity, equity, and inclusion elements, including but not limited to team members from Minority Serving Institutions (e.g. Historically Black Colleges and Universities (HBCUs)/Other Minority Institutions), Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or members within underserved communities.
- Geographic diversity and potential economic impact of projects.
- Whether the use of additional DOE funds and provided resources are non-duplicative and compatible with the stated goals of this program and the DOE mission generally.
- The degree to which the submission exhibits technological or programmatic diversity when compared to the existing DOE project portfolio and other competitors.
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers.
- The degree to which the submission is likely to lead to increased employment and manufacturing in the United States or provide other economic benefit to U.S. taxpayers.
- The degree to which the submission will accelerate transformational technological, financial, or workforce advances in areas that industry by itself is not likely to undertake because of technical or financial uncertainty.
- The degree to which the submission supports complementary DOE funded efforts or projects, which, when taken together, will best achieve the goals and objectives of DOE.
- The degree to which the submission expands DOE's funding to new competitors and recipients who have not been supported by DOE in the past.
- The degree to which the submission enables new and expanding market segments.
- Whether the project promotes increased coordination with nongovernmental entities for the demonstration of technologies and research applications to facilitate technology transfer.

National Environmental Policy Act (NEPA) Compliance

DOE's administration of the American Made Challenges: Ocean Observing Prize is subject to NEPA (42 USC 4321, et seq.). NEPA requires federal agencies to integrate environmental values into their decision-

making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at http://nepa.energy.gov/.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all participants in the SPLASH-C Contest will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their participation in the prize competition. Participants may be asked to provide DOE with information on fabrication and testing of their device such that DOE can conduct a meaningful evaluation of the potential environmental impacts.

Return of Funds

As a condition of receiving a prize, competitors agree that if the prize was made based on fraudulent or inaccurate information provided by the competitor to DOE, DOE has the right to demand any prize funds or the value of other non-cash prizes be returned to the government.

Definitions

Prize Administrators mean both the Alliance for Sustainable Energy LLC operating in its capacity under the Management and Operating Contract for the National Renewable Energy Laboratory (NREL), and the U.S. Department of Energy. When the Prize Administrators are referenced in this document, they refer to staff from the Alliance for Sustainable Energy, the Pacific Northwest National Laboratory, and the U.S. Department of Energy. Ultimate decision-making authority regarding contest matters rests with the Director of the Water Power Technologies Office.

ALL DECISIONS BY DOE ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CONTEST.

Appendix B. Relevant Mission Space

The Ocean Observing Prize invites competing teams to design, build, and test novel, wave-powered self-charging autonomous underwater vehicle systems that, with refinement, would be suitable for a 6-month deployment in the Atlantic Ocean to monitor hurricane formation. Prototypes built during this competition are not meant to be mature systems but should demonstrate basic functionality and potential for refinement into a commercially viable product. When designing systems, competing teams must adhere to the contest rules and requirements specified in this document. Designs and prototypes will be assessed through the three contests: DESIGN, BUILD, and SPLASH-C.

This section presents information regarding how ocean scientists use existing ocean observing platforms such as gliders and drifting floats to study and forecast hurricane formation, path, and intensity at sea.

Hurricane Monitoring Mission Description

Tropical storms, cyclones, and hurricanes are extremely energetic storms that originate far out at sea. As these storms strengthen over warmer waters, they create high winds and large waves. When these storms reach the coast, they can devastate coastal communities through wind damage and flooding.

Society's ability to forecast the trajectories of these storms has improved significantly over the past two decades, yet our ability to forecast the intensity of the storms is still limited. Without the ability to provide communities with good intensity forecasting, evacuation plans and coastal protection efforts are adversely affected. For example, the difference between a Category 3 and Category 4 hurricane could be the difference between a storm surge of 9 feet and 18 feet, respectively, above normal levels.

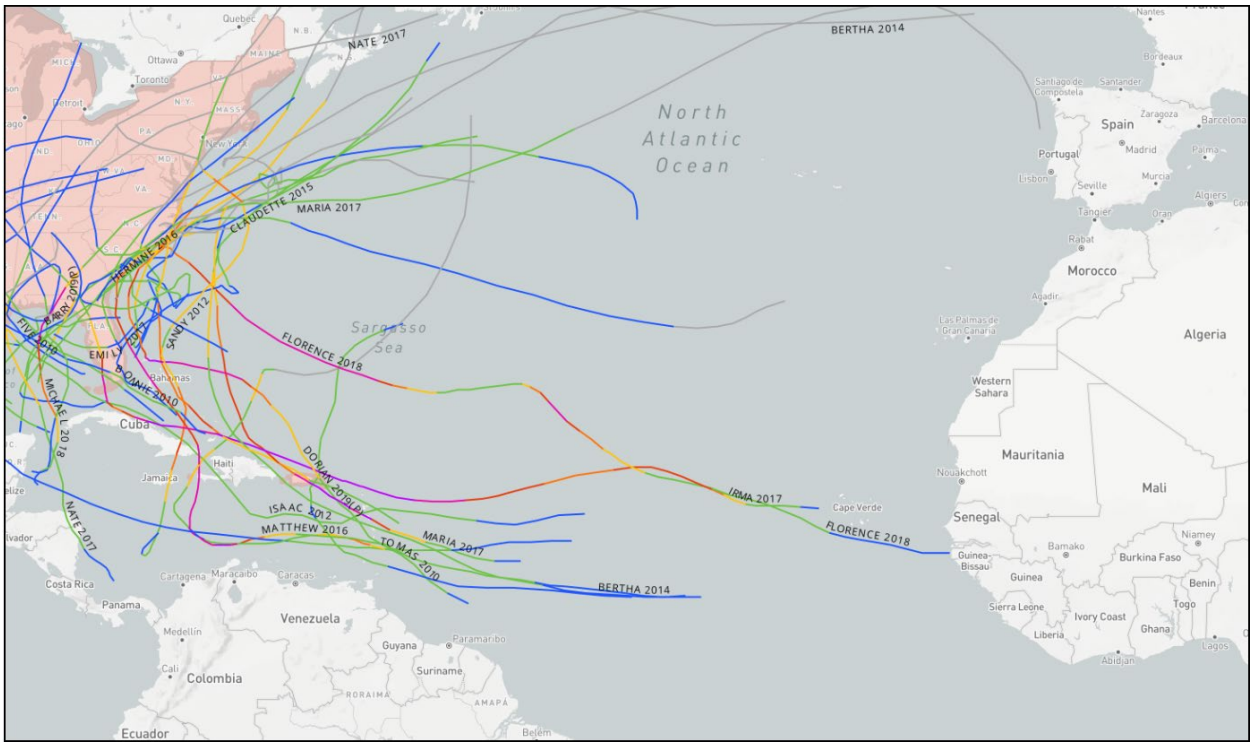

Figure 2. Major Atlantic hurricane tracks for the past decade. *Source: NOAA National Ocean Service*

Models can be useful for predicting the effects of storms, but they rely on accurate data collected from within the storms. Unfortunately, collecting in situ data on tropical cyclones and hurricanes is difficult for three reasons: (1) their stochastic nature makes it difficult to anticipate when and where they will occur; (2) storm environments are extremely energetic and create difficult operating conditions for people and robots; and (3) even with austere power management measures, existing systems struggle to operate in one location for the full length of a hurricane season. If these data could be collected, scientists might better understand storms and improve intensity forecasting accuracy, ultimately saving lives and reducing financial impact to coastal communities.

The data desired to inform these models would be basic ocean and atmospheric properties measured before, during, and after a hurricane. Those who model hurricane intensity desire ocean data on temperature, conductivity, wave motion, and current velocity. Desired atmospheric measurements are air temperature, air humidity, and wind velocities. Such properties are commonly collected using commercially available conductivity, temperature, and depth and acoustic Doppler current profiler instruments. Collecting these types of data requires a platform that can be quickly and safely deployed in advance of the storm and then loiter in a designated area until it approaches. Loitering could be as short as a couple days or as long as 6 months from June through November (the typical hurricane season in the Atlantic). Ideally these ocean and atmospheric properties that characterize the air-sea interaction would be sampled at regular intervals by performing a controlled descent from the surface to approximately 200-meter depths and then returning to the surface.

Some scientists have noted that during ascents, buoyancy gliders are sometimes unable to reach the surface when there is a plume of freshwater near the surface. Data collected by systems out at sea need to be precisely located temporally and spatially, and then delivered to scientists on shore; ideally this is done via satellite communication at least once per day.

Particular areas of interest to scientists and researchers that study hurricane formation include the Gulf of Mexico, east of the Caribbean Sea, the Gulf Stream offshore of the Southeast coast of the United States, and the mid-Atlantic near New Jersey and Delaware. These locations are known to have essential ocean features and processes important to hurricane formation, such as mixing of deep cold water and warm surface waters. Some of these locations are in very deep waters, rendering systems that require moorings impractical and cost-prohibitive. These likely deployment locations often have strong surface currents that could vary from 0.2 meter per second (m/s) to more than 1.5 m/s, often pushing platforms off their intended course. Existing gliders are unable to respond quickly to changes in course or explore areas of interest and lack the ability to overcome even a marginal surface current due to energy limitations. Responsive navigation is needed to respond to changes in mission needs and dynamic environmental conditions.

Current ocean observing platforms used for at-sea hurricane monitoring, such as buoyancy gliders and drifter floats, are typically shipped to deployment locations using commercial carriers like UPS and FedEx. On shore, the platforms are often moved from the assembly location to the deployment vessel in the bed of a pickup truck to avoid the need for specialized trucks. It is common practice to use any vessel of opportunity that could be chartered in the area to deploy the ocean observing platform. Such vessels used for deploying the platform vary in size but are typically less than 10 meters long and will have between two and five crewmembers aboard. Existing platforms are often deployed and recovered with only two trained crewmembers.

Once the system is deployed, it is unlikely to be visited again by a ship unless it is to be recovered, so systems must account for storm survivability, biofouling, and other issues that may affect the

performance over the deployment duration. If platforms cannot perform as needed, this limits the amount of useful data that they can collect and jeopardizes the mission.

The current paradigm ocean scientists struggle with is balancing system power consumption and deployment duration. More frequent sampling, propulsion, or communications increases power consumption, which rapidly drains batteries and reduces the length of time the system can be deployed and increases the frequency at which it needs to be recovered. Power management is crucial to the system design to maximize data collection and deployment time. A system that possesses the ability to self-charge would change this paradigm and allow scientists to focus on maximizing data collection instead of minimizing power consumption.

> *"Everything about autonomous platforms at sea comes down to power budget. This is our limiting factor." —Ocean scientist studying hurricanes at sea using buoyancy gliders*

There are a variety of in situ energy harvesting options available to systems performing hurricane monitoring at sea: solar, wind, waves, currents, and even thermal gradients in the ocean. Regardless of the energy harvesting method used, the system should have a battery that is sufficiently sized to ensure that it maximizes uninterrupted data collection without jeopardizing loss of the system over the entire 6-month deployment.

Finally, the safety of humans and the environment is paramount when using ocean observing platforms. Technologies used are safe to handle by trained crew and cause no adverse environmental impact.

Appendix C. Summary of TEAMER Rules

- The TEAMER Network is capable of providing testing support and expertise to test and validate technologies with the goal of making critical breakthroughs in the marine renewable energy (MRE) sector. The TEAMER Program provides MRE technology developers and researchers with access to a network of U.S.-based testing facilities (each a "TEAMER Facility," collectively the "TEAMER Network").
- TEAMER funding is not available for manufacturing or fabrication of marine energy devices.
- For purposes of TEAMER, the term "marine energy" means energy from
  - Waves, tides, and currents in oceans, estuaries, and tidal areas
  - Free-flowing water in rivers, lakes, streams, and manmade channels
  - Differentials in salinity and pressure gradients
  - Differentials in water temperature, including ocean thermal energy conversion.
- The term marine energy does not include energy from any source that uses a dam, diversionary structure, or impoundment for electric power purposes.
- TEAMER support is not available for offshore wind technologies; however, it may be available for testing for components (i.e., mooring, anchors, etc.) that could be used as crosscutting components for marine energy and offshore wind energy.
- Technologies with Powering the Blue Economy applications (https://www.energy.gov/eere/water/downloads/powering-blue-economy-report), including Power at Sea and Resilient Coastal Communities, may apply for TEAMER support provided they are to be powered by MRE.
- TEAMER will not provide assistance for activities (numerical modeling, bench/lab testing, tank/flume testing, open water activities) that are already approved and planned using other Federal funding. This includes Federal financial assistance awards resulting from a Funding Opportunity Announcement (FOA), Small Business Innovative Research (SBIR), prize, or challenge.
- Applicants may request assistance through TEAMER for activities which may relate to, or whose results and/or outputs may be used to inform, activities that are already approved and planned using other Federal funding. The activities, scope, and reporting for each will remain separate (i.e., TEAMER activities versus other Federally funded activities) and will not be combined.
- TEAMER funding for facility use is provided directly to the TEAMER Facility, not to those seeking assistance, or Technical Support Recipients (TSR).
- Once approved for participation in the TEAMER Program, TSRs must also enter into an agreement with the selected TEAMER Facility and comply with the terms and conditions of use (including provisions related to intellectual property) as required by that Facility, prior to accessing that Facility. Prior to moving to the testing phase of the program, the TSR must work with the Facility to develop a Test Plan, which will be approved by the TEAMER Technical Board. Once the Test Plan has been approved, the TSR and Facility will move into the Test Access Period phase of the project.
- TSR is required to provide Pacific Ocean Energy Trust ("TEAMER Network Director") with reasonable access to the TSR's work site while testing at a TEAMER Facility, as well as allowing the Network Director to take photographs of the assistance activity for marketing purposes, provided that, prior to such publication, the TSR will be provided with the opportunity to redact, or restrict the publication of, photos that would otherwise disclose confidential intellectual property owned by the TSR.

- Approved applicants, also referred to as Technical Support Recipients (TSRs), may be highlighted on the TEAMER and DOE websites. Highlighted information may include: TSR name, network facility partner, assistance category, project title, and Public Summary provided in application.
- All intellectual property rights related to the TEAMER Program will be governed by the TEAMER Intellectual Property Management Plan here: https://teamer-us.org/wp-content/uploads/2020/05/TEAMER-IP-Plan-Final-4849-9640-6460-v.1.pdf.

Eligibility

- TEAMER funding is available to support approved TSRs, regardless of the TSR's country of origin, provided that (a) all work performed under the TSR award is performed in the United States and (b) the TSR understands and agrees to all the terms and conditions of the TEAMER Program and the Network Facility member. TSRs are responsible to ensure that the TEAMER Facility (in which the TSR will be testing) does not have non-U.S. citizen access restrictions.
- Employees of DOE and DOE/NNSA FFRDCs are NOT eligible to apply to TEAMER support.
- Research groups are permitted to apply for support at a facility within their own institution with the following restrictions:
    - Support must be provided by different department or cost center than the applicant
    - Funding available for internal institution support may not exceed the total amount allotted for previously and currently supported external Requests for Technical Support, less previously and currently supported internal Requests for Technical Support
        - For example, if a facility has been previously awarded external support of $100,000 and has not been awarded internal support, then applications for support within their own institution for up to $100,000 could be considered in the current RFTS. If a facility has been previously awarded external support of $100,000 and has also been awarded support for an application within their own institution for $25,000, then applications for support within their own institution for up to $75,000 could be considered in the current RFTS.
- In order to be considered for participation in the TEAMER Program, applicants must (a) consult with a pre-approved test facility (https://teamer-us.org/teamer-facility-network/) to determine whether their proposed test is within the capabilities of that facility, and (b) submit a RFTS application, which becomes available when the application period opens. Additional information on "how to apply" can be found here: https://teamer-us.org/how-to-apply/.
- Participation by approved TSRs in the TEAMER Program requires the agreement of the approved TSRs to comply with applicable TEAMER Terms and Conditions. The current TEAMER Terms and Conditions can be found here: https://teamer-us.org/wp-content/uploads/2020/05/WEBSITE-TERMS-AND-CONDITIONS-4814-2710-6234-v.4.pdf. TEAMER Terms and Conditions are subject to change. Approved TSRs should consult the TEAMER website frequently.

Post Access Requirements

TSRs are required to complete (within 60 days of the completion of activity at the TEAMER Facility) a series of post access requirements, including, but not limited to:

- Completion of a Post Access Report, following the template here: \\doe.local\dfsfr\VDI_Cloud\FolderRedirection\carrie.schmaus\Downloads\at https:\teamer-us.org\test-plan-post-access-report-template\, which must be reviewed and approved by the TEAMER Facility and TEAMER Technical Board;
- Uploading to the TEAMER DOE Marine and Hydrokinetic Data Repository here: https://mhkdr.openei.org/ ("MHK-DR") (a) data demonstrating progress toward meeting the objectives identified in Sections 1 & 8 of the TSR application, and (b) scripts and data used to

generate all figures, tables, and charts in the final report to the MHK-DR. TSRs are advised that artificially limiting the number of figures in the final report (to avoid disclosing underlying data) will be considered non-compliance with final reporting requirements and will not be approved;
- Review and approval of all Post Access Reports by the TEAMER Facility and TEAMER Technical Board; and
- Completion of a post access questionnaire about the TSR's TEAMER Program experience.

Travel Reimbursement and Shipping Funding

The TEAMER Network Director is authorized to reimburse TSRs up to $1,000/week for certain travel related expenses. Travel reimbursement is contingent upon receipt and approval by the TEAMER Network Director of the TSR's completed Post Access Report. Additional expenses for shipping of test articles and other allowable expenses may be reimbursed, if pre-approved by the TEAMER Network Director. Travel and expense reimbursement is not available to international TSRs at this time. Please inquire with the TEAMER Network Director for more information.

Certain Restrictions

- RFTS budget proposals exceeding $150,000 are permitted but must demonstrate the scope cannot be reduced into multiple requests. See the FAQ for more detail.
- Applications exceeding $250,000 are not permitted.
- TSRs that are past due on any TEAMER requirements will not be eligible to apply for participation in additional Request for Technical Support ("RFTS") cycles, nor will their travel/shipping stipends be reimbursed. TSRs that are delinquent in reporting may not be eligible for a travel reimbursement.
- Any publication or scientific paper resulting from assistance received through TEAMER must acknowledge the TEAMER Program.
- Additional requirements and restrictions may be contained in agreements entered into by the TSRs with network facility members and the Network Facility Director.
- An applicant may not submit more than 2 applications per RFTS and may have no more than 4 active projects at one time.
- Applicants may only apply for assistance in one category (numerical modeling and analysis, bench/lab testing, tank/flume testing, open water activities) per RFTS application. Multiple facility applications are permitted but must demonstrate coordination between facilities to accomplish the RFTS.
- Applicable Special Terms and Conditions, as presented on the TEAMER website, also apply.