Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)

Marine Energy Systems Innovation at Sea

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Submission Deadline for Concept Papers:	12/02/2022 5:00pm ET
Submission Deadline for Full Applications:	2/24/2023 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	4/14/2023 5:00pm ET
Expected Date for EERE Selection Notifications:	May 2023
Expected Timeframe for Award Negotiations:	May – Sep 2023

- Applicants must submit a Concept Paper by 5:00pm ET on the due date listed above to be eligible to submit a Full Application.

- To apply to this FOA, applicants must register with and submit application materials through EERE eXCHANGE at https://eere-eXCHANGE.energy.gov, EERE's online application portal.

- Applicants must designate primary and backup points-of-contact in EERE eXCHANGE with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the selection.

- **NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process. Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process they should utilize the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that**

entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: GSAFSD Tier 0 Knowledge Base - Validating your Entity.

Modifications

All modifications to the FOA are [HIGHLIGHTED] in the body of the FOA.

Mod. No.	Date	Description of Modification
0001	10/19/22	1. Extended Concept Paper due date from 11/4/22 to 12/2/22. 2. Modified section B. Cost Sharing to revise cost share requirements for institutions of higher education and non-profit organizations. 3. Clarified language regarding comms with NREL during the application/negotiation process on pages 27, 28 and 32. 4. Added in Appendix I for Desalination resources.
0002	11/2/22	1. Spelled out IOM&D (installation, operations, maintenance, and decommissioning) on pages 29 & 33. 2. Added additional desalination resources to Appendix I.

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I. Funding Opportunity Description

A. Background and Context

i. Background and Purpose

The Office of Energy Efficiency and Renewable Energy (EERE) is issuing, on behalf of the Water Power Technologies Office (WPTO), a Funding Opportunity Announcement (FOA) titled "Marine Energy Systems Innovation at Sea." Marine energy resources, such as wave, tidal and ocean currents, are abundant, geographically diverse, energy dense, and complementary to other renewable energy sources. Significant in-water testing has occurred in recent years, both domestically and internationally, to prove performance and reliability for systems that provide electricity for the grid. Marine energy can also serve the needs of many blue economy markets, including producing fresh water through desalination, servicing the power demands for aquaculture and ocean sensing, and supporting coastal resilience through microgrid functionality. This FOA supports wave powered systems innovation for desalinated water production applications, research and development for *Powering the Blue Economy(PBE)™* markets, and a feasibility assessment for an ocean current test facility.

Building a clean and equitable energy economy and addressing the climate crisis is a top priority of the Biden Administration. This FOA will advance the Biden Administration's goals to achieve carbon pollution-free electricity by 2035 and to "deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050"[1] to the benefit of all Americans. The Department of Energy is committed to pushing the frontiers of science and engineering, catalyzing clean energy jobs through research, development, demonstration, and deployment (RDD&D), and ensuring environmental justice and inclusion of underserved communities.

The research and development (R&D) activities to be funded under this FOA will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this FOA will accelerate the development and testing of renewable marine energy technologies at sea by focusing on wave and ocean current resources as well as reductions in the energy use and carbon emissions associated with desalination. Focus on these areas advances both the Biden Administration's clean energy goals and the EERE

[1] Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

objectives of expanding and diversifying the Nation's energy portfolio. Simultaneously, this FOA will improve drinking water supplies in disaster scenarios and for remote, underserved communities. Improvement to water availability supports the White House Action Plan on Global Water Security Pillar 1 by improving access to sustainable and equitable water, sanitation, and hygiene (WASH) services and Pillar 2[2] through the development and deployment of modular energy-efficient, low carbon, and low-cost technologies for electrified desalination.

This is the first FOA investment in a *Powering the Blue Economy* (*PBE)™*[3] market application with an emphasis on desalination. WPTO's focus on desalination directly supports coastal and island resilience, and incorporates end-user needs assessments, translating user requirements for design and advancement of marine energy technologies. In fact, there are many broad lessons to be shared across PBE from focusing on small-scale devices in WPTO's approach to desalination R&D; some examples are wave conversion to direct hydraulic pressure, modeling and analysis of small-scale Wave Energy Converters (WECs), optimizing energy harvesting in low-energy or average wave conditions, and deployable and inflatable designs. An important consideration for this FOA and other PBE activities is the criticality of learning and adopting lessons across marine energy R&D to accelerate industry technology readiness levels.

This announcement works toward the following technology goals laid out in WPTO's Multi-Year Program Plan (MYPP) regarding System, Design and Validation:

- By 2025, Complete at-sea, pre-commercial demonstrations of newly developed marine energy-powered ocean observing systems and desalination systems.
- By 2030, wave powered desalination systems are deployed for the first uses in disaster recovery or international development scenarios.
- By 2030, documented improvements in energy-water system resilience and security for a number of targeted remote communities, enabled by marine energy systems.

This FOA accelerates the development and field testing of wave powered desalination technologies to provide zero-carbon, affordable, and reliable

[2] https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-vice-president-harris-announces-action-plan-on-global-water-security-and-highlights-the-administrations-work-to-build-drought-resilience/

[3] https://www.energy.gov/eere/water/powering-blue-economy

sources of drinking water for disaster relief, emergency response, and small communities facing water scarcity and security issues. Previous research has demonstrated the feasibility of small, modular, wave-powered desalination systems through theoretical studies[4], laboratory testing, and short-duration at-sea testing[5]. This FOA will continue investment in this technology space through long-duration (i.e., two weeks to six months) at-sea testing of integrated wave-powered desalination systems, and innovative sub-systems and components. It will additionally support commercialization opportunities for novel technologies. This FOA focuses on innovation of wave energy converters WECs for nearshore, low-energy wave environments across a diversity of coastal conditions through sub-system technology development and deployment-based innovation via integrated system testing and operation. Innovations resulting from this FOA will advance *PBE™* markets, support the White House Action Plan on Global Water Security[6], and advance the Biden Administration's ambitious decarbonization goals.

ii. Technology Space and Strategic Goals

This FOA supports marine energy research and additional test capabilities in three Topic Areas: (1) Marine Energy Powered Desalination System Innovation at Sea; (2) Marine Energy Powered Desalination Open Topic; and (3) Ocean Current Test Facility Feasibility Assessment.

Topic Area 1: Marine Energy Powered Desalination System Innovation at Sea

Recognizing the success of the WPTO Marine Energy Program's Waves to Water (W2W) Prize[7] in fostering innovative wave power desalination technologies with a strategic focus on deployment, marine operations, and design robustness for an in-water competition, this FOA seeks to advance and commercialize designs focused on longer-duration at-sea testing and operations, reliability testing of key components and sub-assemblies, and deployment-based innovation for disaster relief and small-scale community water systems. WPTO's focus is on addressing the practical and necessary obstacles of deploying in the ocean environment by providing industry with flexible innovation pathways such as

[4] Yu, Yi-Hsiang, and Dale Jenne. 2017. "Analysis of a Wave-Powered, Reverse-Osmosis System and Its Economic Availability in the United States." 36th Annual International Conference on Ocean, Offshore and Arctic Engineering. Trondheim, Norway. June 25–30. https://www.nrel.gov/docs/fy17osti/67973.pdf.

[5] https://www.energy.gov/eere/articles/doe-announces-winners-wave-energy-powered-desalination-prize-competition

[6] https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-vice-president-harris-announces-action-plan-on-global-water-security-and-highlights-the-administrations-work-to-build-drought-resilience/

[7] Waves to Water Prize (URL: https://americanmadechallenges.org/challenges/wavestowater/index.html)

pilot scale testing of systems/prototypes or specific testing of sub-systems and assemblies.

This FOA aims to build a collective community around technical and logistical issues of deployment, such as feasible launching strategies, operations and tuning, near-shore anchoring systems, accelerated fatigue cycles of critical components in oscillatory wave environments, and novel material strategies around inflatable and collapsible systems. This supports WPTO's goal to learn generalizable and translatable lessons for industry to advance the state-of-the-art in small-scale wave capture and desalinating technologies. WPTO's strategy is to pursue multiple paths of facilitation of in-water deployment and testing for marine energy devices operating in the nearshore environment.

Focusing on in-water testing will accelerate system innovations critical to the commercialization and development of the marine energy industry – these types of challenges are often underappreciated. Additionally, the *PBE*™ Initiative accelerates technology advancement by encouraging small scale iterative in water testing to facilitate rapid demonstration to inform designs, with the potential to reduce cost and time, and create pathways to pursue solutions to some of the practical challenges facing industry, and to provide multiple options for significant technological gains.

Working in the marine environment, especially the nearshore zone, presents inherently difficult engineering challenges that are significant barriers to industry commercialization and advancement. A key priority of this topic area is to develop robust wave energy devices that operate reliably over weeks and months, meet functional design requirements, and expand industry knowledge and lessons learned at sea. The W2W prize was critical to informing the R&D goals of this topic area with a focus on practical in-water and material challenges.

Through the lens of the W2W prize, particular challenges and areas of interest identified include reverse osmosis (RO) integration, installation and retrieval methodologies, electric versus hydraulic RO system operation, water storage at device versus pumping to shore, optimizing power production and device weight versus lightness and quickness of technologies for end-users, design for manufacturing, Commercial Off the Shelf (COTS) component usage, and transferable lessons for future development of cost-competitive systems.

This topic area builds off the W2W prize by removing some constraints which may inhibit wave energy technology optimization for desalination. Examples of this include the use of a common anchoring/mooring system and the short design cycles and risk reduction emphasis of the Drink stage, both of which led

to biases that limited design options and impacted performance benchmarks for water production and energy capture. In order to mitigate these biases, this topic area couples reduced constraints with an approach of *integrated design and testing* to provide structure and frequent iteration cycles to ensure technologies developed meet fundamental ocean engineering challenges.

In order to accelerate design and technology advancements around wave energy converters for the marine energy industry, it is crucial to design, build, and test devices at the smallest scale practical that provides representative data and conclusions. This "smaller, faster, cheaper" mindset not only reduces time needed to learn valuable information, but also lowers the barrier to physical device validation for researchers and entrepreneurs so that more quality ideas can be tested. While the announcement does not specifically constrain the size of devices for wave powered desalination, there is a focus on small, lightweight designs that can be easily and cost-effectively deployed and retrieved. Where appropriate, larger-scale designs can consider component level development and validation (See sub-topic 1b).

To serve the purposes of driving "smaller, cheaper, faster" innovations, this FOA defines long-duration deployment as ranging from 2 weeks to 26 weeks. Additionally, there are multiple testing opportunities, whether lab-assisted or at-sea trials, across a diverse and differentiated set of testing locations and devices to maximize innovation gains for wave powered disaster relief operations or small-scale community systems. This combination of smaller device scale and multiple testing opportunities per award is intended to incentivize an iterative approach to problem solving and support design convergence around marine energy powered desalination systems.

For marine energy technology developers, data is an accelerant towards commercialization. A clear advantage of testing data is understanding realistic performance, as well as developing simple and robust solutions for working in the harsh ocean environment. Multiple testing cycles supports technology advancement and design evolutions that are fundamental to developing wave energy technologies. Similarly, industry will benefit greatly from gathering in-water testing data that can be used to publish performance benchmarks, as well as broad industry lessons – much of the return on investment for the marine energy community is establishing baseline knowledge of applications to inform future planning and research to de-risk technologies for eventual commercial adoption. With this in mind, this announcement lays out novel data requirements and testing design requirements intended to support WPTO's data goals.

A core approach to WPTO's *PBE™* Initiative is a focus on defining end-user requirements and customer interaction. Ideally the PBE community will complement standard approaches to technology cost targets like levelized cost of electricity (LCOE) or levelized cost of water (LCOW) by defining a process of design feedback and interaction with potential end-users. This could lead to more informed perspectives on device operational requirements for certain applications, such as changing RO filters at sea, or how communities might manage pre-treatment. These insights could be critical to matching the practical needs of specific markets such as disaster response and recovery. WPTO considers this to be fundamental to progressing the industry as opposed to representing an additional requirement, and certain criteria in this announcement reflect these ideas.

As part of the WPTO W2W Prize, the National Renewable Energy Laboratory (NREL) designed and commissioned a hydraulic and electric reverse osmosis (HERO) wave energy converter (WEC) device to help guide de-risking of the final drink competition as well as help inform development of competition deployment protocols. The initial system is designed to provide quick study of at-sea installation and measurement, such as the study of electric, hydraulic, and anchoring connections, and can serve as a data reference point for devices, subsystems, and components developed through this FOA. (See topic area descriptions under headings "National Laboratory Support / Partnership").

To leverage NREL's research and development activities related to wave-powered desalination, awardees will be strongly encouraged to work directly with the hydraulic and electric reverse osmosis wave energy converter (HERO-WEC) design and installation team to support component and system testing. This can include performance testing, structural and fatigue testing, and instrumentation design and support, among other requests. The intent of this collaboration will be to build upon existing knowledge within NREL's design and testing teams through technical assistance.

Topic Area 2: Open Topic Marine Energy Powered Desalination

WPTO expects that marine energy industry stakeholders have ideas for impactful research, potentially unanticipated by WPTO, that can directly impact marine energy powered desalination and benefit the R&D community or industry as a whole. This topic area is intended to capture concepts or advancements that can benefit desalination broadly. While this topic lacks specific technology goals, many of the technology concepts of Topic Area 1 are likely relevant to the open topic. Applications should be in the areas of wave energy, tidal energy, ocean current energy, or ocean thermal energy powered desalination. Proposals should advance the state of the industry and address a challenge or opportunity

requiring some form of desalinated water, either drinking water or other water use.

Topic Area 3: Ocean Current Test Facility Feasibility Assessment

WPTO's Marine Energy program supports research and development to advance reliable, cost-competitive marine energy technologies from components and sub-systems, to devices and arrays for both blue economy markets and utility grid power production. Technology advancement, particularly for array-scale systems targeting the utility grid market, requires open water validation of system performance, efficiency, and reliability, especially in extreme sea states, of commercially ready prototypes. Due to the complexity of wave physics of high-energy sea states and the fluid dynamics of sub-sea currents, even simple marine energy prototypes must be validated in open water to acquire data that accurately reflects system performance. This validation is expensive and time consuming due to the unique challenges of the marine environment, and it is generally beyond the capacity of technology companies that comprise the marine energy industry.

The Marine Energy Program is committed to investment in early-stage R&D that enables the domestic marine energy industry to advance toward achieving cost competitiveness for utility market systems across the various marine energy resource types. This will be accomplished by focusing on design concepts that have the potential to increase energy capture and annual energy production of devices, improve reliability and availability, and reduce capital and operating and maintenance costs. Achieving these goals requires extensive testing in both laboratory and open water environments. The purpose of this topic area is to evaluate the feasibility of a test center to advance current energy converter technologies designed specifically to capture the energy of ocean currents.

Ocean currents, like the Gulf Stream, are geostrophic surface currents that flow along the eastern shorelines (a.k.a. western boundary currents) of all oceans. They are like the atmospheric jet stream in that they are large, persistent, and meandering. As such, they have potential to provide meaningful clean energy, particularly in geographically constricted areas where flow meander is less than in the open ocean. However, ocean currents are one of the most challenging ocean resources to characterize (e.g. there is a wide range in the theoretical resource estimates for the Gulf stream ranging from 1GW to over 200GW[8]) as well as one of the most challenging ocean resources to capture because technology will be located far from shore in deep water and subject to a highly dynamic environment and extreme weather events. Like the jet stream, the Gulf Stream and all western boundary currents play a significant role in both the

[8] https://www.nrel.gov/docs/fy21osti/78773.pdf

global climate and local environment. The Gulf Stream is also home to many threatened and endangered species and potential test sites will be subject to government oversight that spans federal, state, and local agencies.

For these reasons, planning, developing, and operating an ocean current test is anticipated to be a complex and costly endeavor. Under this topic area, WPTO is evaluating the feasibility of establishing an ocean current testing facility to amortize testing costs across many developers and to reduce barriers to testing. Thus, prior to investing in the development of an ocean current test center, a feasibility study is needed to provide a comprehensive technical and financial evaluation for establishing such a facility. Of particular importance will be determining which environmental impacts will be monitored and how those impacts might be mitigated.

iii. Diversity, Equity, and Inclusion

It is the policy of the Biden Administration that:

> [T]he Federal Government should pursue a comprehensive approach to advancing equity[9] for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.
>
> By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.[10]

[9] The term "equity" means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

[10] Executive Order 13985, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government" (Jan. 20, 2021).

As part of this whole of government approach, this FOA seeks to encourage the participation of underserved communities[11] and underrepresented groups. Applicants are highly encouraged to include individuals from groups historically underrepresented[12,13] in STEM on their project teams. As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a Diversity, Equity, and Inclusion Plan that describes the actions the applicant will take to foster a welcoming and inclusive environment, support people from underrepresented groups in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in or benefit underserved communities (See Section IV.D.). The plan should include at least one SMART (Specific, Measurable, Assignable, Realistic and Time-Related) milestone per budget period supported by metrics to measure the success of the proposed actions. This plan will be evaluated as part of the technical review process and incorporated into the award if selected.

[11] The term "underserved communities" refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list of in the definition of "equity." E.O. 13985. For purposes of this FOA, as applicable to geographic communities, applicants can refer to economically distressed communities identified by the Internal Revenue Service as Qualified Opportunity Zones; communities identified as disadvantaged or underserved communities by their respective States; communities identified on the Index of Deep Disadvantage referenced at https://news.umich.edu/new-index-ranks-americas-100-most-disadvantaged-communities/, and communities that otherwise meet the definition of "underserved communities" stated above.

[12] According to the National Science Foundation's 2019 report titled, "Women, Minorities and Persons with Disabilities in Science and Engineering", women, persons with disabilities, and underrepresented minority groups—blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are vastly underrepresented in the STEM (science, technology, engineering and math) fields that drive the energy sector. That is, their representation in STEM education and STEM employment is smaller than their representation in the U.S. population. https://ncses.nsf.gov/pubs/nsf19304/digest/about-this-report For example, in the U.S., Hispanics, African Americans and American Indians or Alaska Natives make up 24 percent of the overall workforce, yet only account for 9 percent of the country's science and engineering workforce. DOE seeks to inspire underrepresented Americans to pursue careers in energy and support their advancement into leadership positions. https://www.energy.gov/articles/introducing-minorities-energy-initiative

[13] See also. Note that Congress recognized in section 305 of the American Innovation and Competitiveness Act of 2017, Public Law 114-329:

> (1) [I]t is critical to our Nation's economic leadership and global competitiveness that the United States educate, train, and retain more scientists, engineers, and computer scientists; (2) there is currently a disconnect between the availability of and growing demand for STEM-skilled workers; (3) historically, underrepresented populations are the largest untapped STEM talent pools in the United States; and (4) given the shifting demographic landscape, the United States should encourage full participation of individuals from underrepresented populations in STEM fields.

Further, Minority Serving Institutions[14], Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or entities located in an underserved community that meet the eligibility requirements (See Section III.) are encouraged to apply as the prime applicant or participate on an application as a proposed partner to the prime applicant. The Selection Official may consider the inclusion of these types of entities as part of the selection decision (See Section V.C.).

B. Topic Areas

Topic Area 1: Wave Powered Desalination Systems Innovation at Sea
WPTO intends to support the further advancement and commercialization of wave powered desalination technologies by focusing on technical and logistical challenges of longer-duration deployments (2 weeks to 26 weeks) and full-scale systems, and/or reliability and performance testing across sub-systems, components and prototype systems, necessary for the advancement of disaster relief and small-scale community water systems. This FOA will aim to build a community of solvers around common challenges, such as feasible and cost-effective launching strategies, marine operations and device performance, near-shore anchoring and mooring systems, accelerated fatigue cycles of critical components in oscillatory wave environments, and novel material strategies around inflatable and collapsible systems.

This Topic Area (TA) provides two subtopics, TA1a Deployment-Based Innovation and TA1b Components and Sub-Assemblies.

TA1a Deployment-Based Innovation
This subtopic is focused on existing system designs where a full system integration of all components has been completed with some degree of in-water and/or laboratory validation. The principal focus is on ***deployment-based innovation*** to prove out robust, reliable, and survivable designs, where system challenges could see demonstrable innovation. The structure of this development path employs an integrated test and design approach. This implies that new and/or high-risk components or additions should be validated either at sub-scale or in the lab prior to system integration. Technical quality and accuracy of system designs, potential at-sea testing, and iterative process of design and testing will be the primary criteria for success.

[14] Minority Serving Institutions (MSIs), including Historically Black Colleges and Universities/Other Minority Institutions as educational entities recognized by the Office of Civil Rights (OCR), U.S. Department of Education, and identified on the OCR's Department of Education U.S. accredited postsecondary minorities' institution list. See https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

WPTO is particularly interested in proposals testing cost-effective deployment and installation practices, logistics and marine operations, anchoring systems, and in-water performance targets. Applicants will need to emphasize how in-water testing is critical for advancing their prototype, establish key performance measures, and de-risk a next-generation or larger scale prototype.

WPTO encourages applicants to consider advanced manufacturing techniques and material approaches that are intended to increase system reliability or overall system robustness. Considering the challenges of delivering water for disaster relief or small-scale water systems, it is vital to develop systems that will operate to meet the service demands - flexible and novel approaches are encouraged in order to handle the difficult challenges of the ocean, installation challenges and procedures, and other critical system challenges.

Technical Requirements for TA1a:

- **System Readiness:** Applicants must have an existing WEC system design and/or an existing WEC (i.e., already fabricated) that has achieved a Technoloy Readiness Level (TRL) 5/6 or greater, as defined in Appendix D.
- **Testing Targets and Benchmarks:**Provide minimum testing targets and/or agreed upon performance benchmarks. The ability to assess system performance during any project is vital and a baseline of expected performance must be established to measure progress during the project.The minimum test targets include:
    - Maximum total dissolved solids (TDS) of 1,000 milligram per liter (mg / l). World Health Organization (WHO)[15] advises a 1000 mg / L guideline for "usually acceptable" palatability for disaster relief applications, and as an independent measure of quantity and time of consumption. Applicants may propose a TDS target for non-emergency water use applications that is defensible.
    - Minimum average liters per minute (LPM) production rate of 0.1 LPM.
    - Other water quality specifications for a chosen end-use (See NATO standards for emergency use, "AMedP-4.9, Edition A, Version 1, Requirements for Water Potability During Field Operations in Emergency Situations[16]). Any chosen end-use will need to provide defensible requirements and forms of measurement.
    - Testing requirement: minimum of 350 hours of freshwater production with a maximum test duration of 26 weeks (~6 months) per deployment, to prove out full system designs or advance existing systems. Ideally this would be continuous or near-continuous operation.

[15] Guidelines for drinking-water quality, 2nd ed. Vol. 2. Health criteria and other supporting information. World Health Organization, Geneva, 1996.

[16] http://www.coemed.org/files/stanags/03_AMEDP/AMedP-4.9_EDA_V1_E_2136.pdf

- Defensible performance metrics (See "TA1 Performance Metrics" and Appendix F)

- **Data Plan Requirements:** Perform a comprehensive set of measurements to quantify system performance and loads. (See "TA1 Required Measurement and Data Reporting" for details.)

Testing Site Considerations

As the primary focus of this announcement is to deploy prototype systems at-sea environment for disaster relief or small-scale community water solutions, the primary site considerations of interest are:

- **Depth:** 3 -15 meters (m)
- **Distance from shore:** less than 1 kilometer
- **Experience with permitting:** Understanding permitting processes, NEPA requirements and timelines, or any established site criteria or pre-permitting processes
- Complete site assessment questionnaire (See Section IV.D.xxxvii)

Note: WPTO recognizes that test sites are proposed and may be subject to change and applicants may not be able to answer all questions in the site assessment questionnaire for the proposed site. Applicants should answer questions in the site assessment questionnaire to the best of their knowledge (i.e., an answer of "unknown at this time" is acceptable).

TA1b Components and Sub-Assemblies

This subtopic seeks solutions across novel components and sub-assemblies of wave powered desalination systems for disaster relief and small-scale communities. The focus of this subtopic is risk reduction and validation of novel, or critical, components within a wave powered desalination system.

Component, or sub-system level, testing can be performed in a controlled laboratory environment or through integration into an existing wave energy converter and/or desalination system. Sub-system integration may include novel desalination systems, power take-off design and/or control strategies, mooring and anchoring solutions, seawater intake or discharge systems, pre- and post-treatment, novel material strategies around inflatable or collapsible systems, etc.

Applicants will need to describe how the proposed sub-system is critical for the advancement of wave powered desalination systems, as well as how it will provide a necessary step towards full system commercialization. Applicants will need to document a development process from early stages of testing/validation of unknown components to a full system deployment/validation exercise. Proposals should realize advancement within the context of full systems, where the focus is on

advancing performance and reducing risk of components to drive overall system innovation.

While this subtopic focuses on components and subassemblies, innovations presented at the component/subassembly level should have meaningful influence on overall system performance (i.e., proposals to optimize components with negligible system impact are specifically NOT of interest). However, understanding how modifications to existing components or product lines could enable adoption by the marine energy sector is of interest.

Original Equipment Manufacturers (OEMs) that have critical components such as pumps, generators, gearboxes, overrunning clutches, etc., that could be modified for marine applications are encouraged to apply. As an example, marinization and corrosion resistance of components are typically limitations of marine energy systems. Additionally many components within the drivetrain and power electronics are limited by atypical input conditions (high force, low speed, wide voltage inputs, etc.). Awardees with a proven product line that has not been validated in a marine energy application are encouraged to leverage the NREL HERO WEC as a potential test platform. This would require working with the NREL team to determine the functional requirements of a particular component so that it can be integrated into the design for testing and evaluation.

WPTO encourages applicants to consider advanced manufacturing techniques and material approaches that are intended to address component reliability and robustness in the harsh marine environment, extreme or non-traditional fatigue life-cycles, and design for manufacturing. Especially important will be focusing on critical points of failure and/or novel wave-desalination performance improvements.

For this subtopic, applicants must:

- Have an existing WEC subsystem or component (i.e., already fabricated) that has achieved a TRL of 3/4 or greater, as defined in Appendix D;
- Define performance metrics or other benchmarks demonstrating how proposed technology improves upon existing designs;
- Define performance metrics or other benchmarks demonstrating or translating how proposed technology will integrate and improve expected performance of a full-scale system (ex: a mooring system would need to demonstrate some specific technical goal and how meeting this goal would improve a full-scale WEC design);
- Identify minimum testing requirements and/or agreed upon performance benchmarks. The ability to assess system performance is vital and a baseline of expected performance will need to be established and met; and

- Establish Data Plan Requirements: Perform a comprehensive set of measurements to quantify system performance and loads (See "TA1 Required Measurement and Data Reporting" and Appendix F for details).

Subtopic 1a Project Structure:

	Expected Tasks / Scopes
BP 1: System Evaluation and Testing: **Duration: Up to 24 months** **Up to 50% of total project budget (suggested 30-40%)**	● Provide documentation, modeling, and actual builds of existing system or sub-systems to evaluate baseline system (Deliverable: As-Built Package); ● Develop integrated test and design plan including: ○ Project management; ○ Test site characterization and assessment, requirements, and permitting processes (Detailed permitting plan that identifies all federal, state, and local permits and/or licenses required for testing at proposed in-water test site. The permitting plan should also include anticipated timelines for when permitting activities would occur.); ○ Develop / verify a data collection and instrumentation plan describing the instrumentation needed and how the data will be used to evaluate system performance whether directly or inferred. Awardees are encouraged to leverage NREL's expertise in instrumentation systems as well as ensuring the data that is collected is appropriate for the proposed experimental plans; ○ Systems engineering requirements and applicable standards; ○ Marine operations plan; ○ Health risk and safety plan; ○ A technical assistance plan with NREL (developed during project negotiations) to support an integrated testing and design plan as well as additional technical efforts. ● For any new components, perform initial sub-scale or individual component testing to reduce risk and inform system evaluation requirements; ● Perform modeling and simulation highlighting key assumptions and findings, intentional use of simulations, and developing a collaboration with NREL to assist with fidelity or

	unknowns. Modeling efforts should include both operational conditions as well as survival conditions on critical sub-systems (e.g., Anchoring, structural loading, Power Takeoff (PTO) loading, etc.); ● Develop a proposed installation and commissioning plan for the wave energy converter system. Any site- and equipment-specific assumptions will need to be described (deployment specifics, water delivery location, on-shore vs in-water desalination); ● Develop risk management and risk reduction plans and procedures, including a Failure, Mode, and Effects Analysis (FMEA) for any sub-systems. Applicants are encouraged to leverage the NREL team and the NREL risk register framework; ● Technology and deployment risks/challenges (e.g., equipment, material, or processes) associated with your concept and how they will be mitigated; ● Updated design document depending on system evaluation and testing; ● Implementation of IEC TC 114 and other standards identified in Appendix H, with a commitment to share relevant feedback with TC 114; and ● Develop a fabrication and assembly plan for the system being tested as well as any test equipment that will be required for testing (whether purchases or existing assets).
BP 1 Critical Design Review	Participate in critical design review (CDR) meeting before the start of BP I System Prototype Build I / At-Sea test I. CDR will include but not be limited to: ● Realistic and achievable integrated test and design strategy; ● Satisfactory completion of BP1 work scope and deliverables; ● Demonstrate that the proposed solution will meet the stated requirements laid out in BP1 and that the proposed solution demonstrates progress when compared with existing solutions; ● Evaluation of FMEA and risk management plan demonstrates clear understanding of risk of at-sea demonstration and relevant marine operations; ● Defined test metrics for later evaluation/validation with numeral modeling / simulation / analysis;

	• Review of data collection plan by NREL team (strongly encouraged to work with NREL TA team prior to CDR); • Review of in-water test site with clear timeline for permitting, NEPA reviews, and additional approvals, as well as effective costs and management of timeline; and • Review of completed prototype prior to testing to ensure testing targets can be met and the system is within required safety requirements as determined by the lead testing organization.
BP1: System Prototype Build I / At-Sea test I	• Fabricate and assemble component or sub-assembly, and document fabrication process to build into a fabrication and assembly document. This must include "as-built" drawings of the final test article; • Perform test procedure as described in BP1 phase I and document test protocol, and any alterations made with justification for any deviation from initial plan; • Quantitative comparison of proposed solution and as-built design against metrics defined in BP1 phase I; • For in-water prototypes, applicants must work with NEPA representatives to ensure the system conforms to necessary environmental regulations; • Develop and document lessons learned based on preliminary testing. Define the objective of each experiment and if the objectives were met. If they were not met, a description of why, and if they were met, a description of how they could have been improved; • Develop proposed changes to the BP1 phase I documentation based on results of testing to determine how the system should be modified or changed in BP2. (design drawings and BOM, test plan changes, risk register updates, install/commissioning/operation plan changes); • Quantify impact to the preliminary metrics based on the design changes proposed for BP2, even if the metric is not met; and • Document changes to all documentation (design, modeling, fabrication, instrumentation, etc.) and submit as BP2 phase I design documentation.
Go / No-Go 1	Participate in go/no-go meeting no later than 60 days prior to the end of BP 1. Go/no-go decision criteria will include but not be limited to: • Satisfactory completion of BPI work scope and deliverables;

	• Likelihood that the project can be completed on schedule and within budget in BP2; • Identified performance requirements and system improvements compared with BP2 design and state of the art baseline; • Review potential design survivability and any indications of reliability or fatigue degradation relevant to device performance in BP2; • Demonstrate that the team has the resources necessary to complete the proposed activities in BP2; • Review effectiveness of current data and instrumentation plan, quality and usefulness of data collected, and ability to provide technical and performance insights; • Third party review of completed prototype, testing protocol, and effective cost and risk management as determined by the lead testing organization; and • Sufficiency and completeness of Marine Operations Plan and Health Risk and Safety Plan.
BP2: System Prototype Build II and At-Sea Test II **Up to 70% of total project budget**	• Develop necessary design, modeling, simulation, instrumentation, testing, documentation based on changes proposed in BP2; • Develop appropriate data collection and experimental design with NREL technical assistance; • Update the Integrated test and design plan; • Demonstrate survivability in off-design conditions based on anticipated survival states or adjacent sub-system failures. • Fabricate and assemble component or sub-assembly, and document fabrication process to build into a fabrication and assembly document; • Perform test procedure as described in BP3 and document test protocol, and any alterations made with justification for any deviation from initial plan; and • Quantify comparison of proposes solution and as-built design against metrics defined in BP1.
Test Readiness Review	• In person review meeting prior to BP 2 testing with at least one DOE / National Lab representative; • Review of health and safety plan, risk management and risk reduction measures, and specific marine operations and installation plans; and

	• Third party review of completed prototype prior to testing to ensure targets can be met and the system is within required safety requirements as determined by the lead testing organization.
BP2: At-Sea Test II	• Develop lessons learned based on final testing. Define the objective of each experiment, if the objectives were met, and how the second iteration compares with the first. If objectives were not met, a description of why, and if they were met, a description of how they could have been improved; • Develop post-testing commercialization and R&D strategies to advance system design; • Decommissioning process and plan.

Subtopic 1b Project Structure:

Budget Period	Expected Tasks / Scope
BP 1: Project Planning / Component Design **Duration:** Up to 24 months **Up to 50% of total project budget**	• Develop detailed description of the component or sub-system proposed and how it will be integrated into a fully functional WEC/CEC system; • Define the process that will be used to develop the functional requirements and how the prototype will be evaluated against the ability to meet the functional requirements; • Developed detailed drawings of component and WEC-RO system designs to concept and/or prototype level; • Conduct numerical modeling or analysis to predict overall system performance, and to analyze specific project performance metrics for component design (e.g., component efficiency target of XX% translates into overall system performance target of YY); • Develop risk management and risk reduction plans and procedures, including a Failure, Mode and Effects Analysis (FMEA), mitigation actions, and a risk register; • Develop component and/or prototype fabrication plan, including list of materials with estimated costs, fabrication hours, and assembly time (at a minimum);

	• Component / system testing strategy and defined performance metrics, especially where components or subsystems are novel and untested; • Design strategies implemented to achieve survivability, reliability, across a wide range of wave conditions; • Develop a data and instrumentation plan. This should include a description of the parameters being measured and an explanation of how they're being used to evaluate system performance, either directly or inferred; • Develop a plan for leveraging NREL support and expertise. Activities specific to numerical modeling, structural and performance validation, techno-economic support, risk assessment, instrumentation and data collection are encouraged. Describe project plan / project management including: ○ Work Breakdown Structure and Gantt Chart of expected tasks, milestones, deliverables, and responsible parties (e.g., subrecipient, if applicable); ○ Spend plan ($ over time). • Materials R&D and/or manufacturing strategy where applicable (highly encouraged); and • Develop a proposed installation and integration plan for the component or subsystem as it integrates into the overall system. Any site-specific assumptions will need to be described (e.g., requires concrete installation pad on shore, requires 4G wireless data connection, etc.).
Critical Design Review	• Review individual design projects overall technical and performance objectives; • Evaluation of integrated design process from sub-component to full system integration; • Evaluation of component testing strategy; • Evaluation of data and instrumentation plan relative to FOA objectives and advancing technology; • Project performance and budget; • Review of manufacturing and material strategies as well as fabrication and component costs; and • Review of risk management and risk reduction measures.
BP1: Develop Prototype	• Implement integrated test and design plan (spec details);

	• Develop manufacturing and/or assembly report, including as-built drawings and/or 3D models of prototype; • Perform data analysis and validation of component level developments, especially comparison of test results and modeling results; • Review and assessment of any design changes based on results, final fabrication and assembly, etc; • Translate validation of component level performance to system level performance, optimization, and/or cost reductions; • Develop Health and Safety Plan for any testing; • Monthly / quarterly status reports; and • Updated risk management plan / risk register / FMEA.
GNG	Participate in go/no-go meeting. Go/no-go decision criteria will include but not be limited to: • Satisfactory completion of BP2 work scope and deliverables; • Likelihood that the project can be completed on schedule and within budget in BP2; • Identified performance requirements and system improvements compared with BP2 design and state of the art baseline; • Demonstrate that the team has the resources necessary to complete the proposed activities in BP3; • Third party technical review and assessment report of cost estimation and verification of proposed deployments, anchoring and mooring system assumptions and component design validity, and risk of marine operations where applicable; and • Assessment of value of component testing plan.
BP2: Final Testing and Validation Duration: Up to 12 months **Up to 70% of total project budget**	• Develop final testing exercise in partnership with award partners or national lab support; • Final technical report highlighting component or sub-system design, its performance compared to any proposed metrics, and a summary of all test results included processed data from experiments; • Future Looking report / assessment; and • Target OEMs, etc, product developers, bring your own PTO, companies that are close but not directed at marine renewable energy (MRE) companies.

TA1 Technical Specifications, Standards, and Certification

Projects must consider relevant International Electrotechnical Commission (IEC) Technical Committee 114 - Marine energy - Wave, tidal and other water current converters technical specifications and Institute of Electrical and Electronics Engineers (IEEE) standards in the design, testing, and validation of the WEC system. Details on relevant IEC and IEEE standards are provided in Appendix H. Applicants will be required to demonstrate that their WEC design adheres to the following technical specifications and standards, as applicable to their project. When standards are not applicable, please specify why with appropriate substantiation:

- IEC TS 62600-2 – Design Requirements
- IEC TS 62600-10 – Moorings

During testing, applicants should follow the technical specifications listed below, as applicable to their project:

- IEC TS 6200-3 – Loads Measurements
- IEC TS 6200-30 – Electrical Power Quality
- IEC TS 6200-40 – Acoustic Measurements
- IEC TS 6200-100 – Wave Energy Converter Performance
- IEC TS 6200-103 – Wave Energy Converter Scale Testing

If selected for an award, project teams are strongly encouraged to work with NREL to make accredited measurements during testing in accordance with IEC and IEEE standards, as discussed in section "TA1 National Laboratory Support / Partnership" below.

Given the nascent nature of the IEC WEC technical specifications, WPTO anticipates that in some cases the standards may need to be modified or augmented to be correctly applied for TA1 testing activities. In this case, the applicant must provide feedback to IEC TC 114 and is encouraged to suggest how the standards could be improved in the future.

TA1 Performance Metrics

TA1 will use energy intensity (also known as specific energy consumption) as a performance metric for comparison between wave-powered desalination systems. Energy intensity is defined as energy absorbed by the WEC (in kWh) per volume of desalinated water produced (in m^3). Applicants must provide all data and assumptions used to calculate energy intensity. This may include, but is not limited to, water production, mooring force, and velocity (rotational velocity of wench, arm, etc. depending on device geometry).

An objective of this FOA is to compare and benchmark numerical results for energy intensity versus actual measured energy intensity via the specified in-water testing plan. The applicant needs to provide a defensible and realistic numerical results, where all assumptions are described. Numerical models should be evaluated based on site conditions that are anticipated at the proposed test site. Once tests have been completed the models should be updated to reflect that actual wave conditions seen during testing. If selected for an award, project teams can work with NREL to develop the set of conditions that will be used for evaluation.

Applicants must also provide economic performance metrics, including but not limited to capital cost, installation costs, and deployment time. Additionally, applicants must provide average, minimum, and maximum values over the deployment period for all water quality metrics as defined by their application. These data will be entered into a content model to estimate LCOW with the help of NREL technical assistance. Understanding LCOW projections will be critical to comparing wave powered desalination system performance against other forms of salt water desalination.

A preliminary assessment of LCOW will be performed based on an applicants cost breakdown structure, and water production estimates for the given site, however actual measured data will be entered into a more complete content model to estimate levelized cost of water LCOW with the help of NREL technical assistance.

In addition to energy intensity, applicants must identify key wave-powered desalination system performance metrics that will be validated during at-sea testing. Examples include peak-to-average mechanical power and capture width ratio, as defined in Appendix I. Applicants must clearly describe the performance metrics for their system and why the metric is relevant and important. Applicants should identify a minimum of two performance metrics in addition to energy intensity, but may identify more if desired.

TA1 Required Measurement and Data Reporting

A central part of TA1 projects is ensuring the wave-powered desalination system performance is comprehensively characterized during open water testing. Accordingly, measurements needed to quantify the quantities identified in the "TA1 Performance Metrics" section must be made during testing. Applicants should make the measurements necessary to comply with the IEC and IEEE standards and technical specifications identified in the "TA1 Technical Specifications, Standards, and Certification" section must be made during open-water testing.

Further, applicants will be required to make all necessary measurements to quantify device performance and to validate design methods and numerical models that were used in system design. These measurements will include, but are not limited to, measurements of device motions, mechanical loads, electrical loads, mooring and anchoring loads, environmental measurements, system reliability, loads during installation, loads during operational sea states, and loads during extreme sea states.

Appendix F presents an extensive list of data that TA1 projects should consider measuring. In their FOA application, applicants should present a detailed data collection plan including a description of the measurements and description of how these measurements will be used to further the technology development. Included in this plan should be a description of any redundant measurements or how measurements will complement each other. It will be expected that awarded applicants will be required to work with the NREL team to ensure that the data and measurement plan is adequate given the assumptions and uncertainties that will be tested during the period of performance.

It is strongly encouraged to leverage NREL technical assistance to develop an instrumentation system and data monitoring to ensure appropriate data collection and data quality. WPTO has reserved funding for the NREL team to provide technical assistance and data collection to selected projects. Please note that applicants should NOT contact NREL during the FOA application process and should only contact NREL regarding technical assistance after selection for an award. Additionally, the data and measurement plan should also include the ability to adequately measure system level performance such as extracted power, system conversion efficiency, etc.

At the completion of the project, these data must be submitted to the appropriate PRIMRE knowledge hub (See Appendix G) as agreed to by the applicant during the DOE award negotiations. Note that marine energy technical data should not be confused with the Data Management Plan required in Section IV.D.xiv.

Awardees will be encouraged to work with NREL after award to leverage the Modular Ocean Data Acquisition (MODAQ) instrumentation system (See section "TA1 National Laboratory Support / Partnership below) and work with NREL TA team on data processing, quality assurance, quality control, and archiving, as described in the TA1 National Laboratory Support / Partnership section.

Marine energy technical data gathered by TA1 awardees that pertains to proposed test sites and their environmental characteristics must be made

publicly available no later than the end of the relevant reporting period, as described in the Technology Space and Strategic Goals section.
Ensuring a robust data collection, acquisition, and quality process is vital to DOE's return on investment.

TA1 National Laboratory Support / Partnership
Collaboration with NREL is encouraged. DOE has allocated funding outside of this FOA for NREL to support FOA awardees. Accordingly, applicants do not need to reserve budget to pay for NREL's support out of their awarded project, though applicants should account for staff resources needed to inform and support activities undertaken with NREL in the project scope and budget (e.g., applicant project team time spent working with NREL during the project). Applicants are **NOT** allowed to communicate with NREL staff about laboratory support on this FOA before FOA awards are made. Instead, applicants should identify the areas in which they would benefit from NREL support in their application. For awarded projects, the details and scope of the support that will be provided will be finalized during award negotiations between the awardee, DOE, and the institution/s providing support. The types of support available are described below. *Questions regarding NREL capabilities should be submitted to the FOA mailbox.*

Applicants are strongly encouraged to leverage the capabilities of NREL in the following areas:

- Hydraulic and electric reverse osmosis wave energy converter (HERO-WEC) - NREL's HERO-WEC design and installation team can support a range of component and system testing. This can include performance testing, structural and fatigue testing, and instrumentation design and support, among other requests. The HERO-WEC has the capability to test both hydraulic and electric systems, and can advise on mooring design, including anchor connection points.
- Measurement Systems, Instrumentation, Data Acquisition, Control Systems, and Data Quality Assurance/Quality Control (QA/QC) – NREL can support deployments to ensure that the instrumentation, data acquisition, and control systems will operate robustly and accurately during a deployment. This can include support on real-time control, data acquisition systems (e.g., Modular Ocean Data Acquisition: MODAQ), instrumentation, mechanical load measurements (e.g., fiber optic strain, acceleration and pressure measurements) and integration thereof. NREL can also provide data QA/QC and metric analysis using lab-developed capabilities, such as MHKiT.

- Lab Testing and Validation – NREL's Flatirons Campus near Superior, Colorado, can provide end-to-end testing capabilities. Facilities and equipment available to FOA awardees include a small wave tank, large amplitude motion platform, range of dynamometers, and 3D printers, among others.
- Accredited Measurements – Awardees are encouraged to work with NREL to leverage NREL's ISO/IEC 17025 accreditation to perform accredited testing to IEC TC 114 standards. Accredited test results can be used for device certification and to demonstrate system viability to project financiers and insurance companies. The ISO/IEC 17025 accreditation confirms that NREL has the quality assurance procedures in place and the expertise to provide high-quality testing more broadly.

In addition, applicants can request R&D support from NREL in areas where each institution has expertise, as identified on the institution's websites:

- NREL: https://www.nrel.gov/water/marine-energy.html

The specific areas in which applicants are encouraged to work with NREL include:

- Wave modeling;
- Wave measurements and site characterization;
- Wave and site data analysis;
- Support designing and fabricating to IEC Technical Specifications;
- Mooring system design and analysis;
- Component and material reliability analysis and testing;
- Development and implementation of risk management strategy;
- Open water testing support and laboratory testing support;
- System performance and loads modeling;
- Extreme event modeling;
- Structural design support;
- High fidelity modeling using computational fluid dynamics (CFD) and finite element analysis (FEA) modeling;
- System design optimization;
- LCOE modeling and analysis;
- Control systems engineering consultation; and
- Installation, operations, maintenance, and decommissioning (IOM&D) planning and execution

NREL support cannot be leveraged to procure or fabricate the WEC system, system components (e.g., moorings and anchors), or to pay for IOM&D activities.

NREL support can be leveraged to procure, fabricate, and deploy data acquisition systems, and testing instrumentation.

Topic Area 2: Open Topic Area (Marine Energy Powered Desalination)

This Topic Area is intended to be open to capture concepts or advancements needed in marine energy desalination broadly. Relevant needs might be translating concepts to early-stage technologies, or pursuing cost-competitive pathways to marine powered desalination systems that scale, or tool/software development. WPTO expects that marine energy industry stakeholders have unanticipated ideas for impactful research that directly impact marine energy powered desalination and provide a broader benefit to the R&D community and industry.

WPTO will consider applications in the areas of wave energy, tidal energy, ocean current energy, ocean thermal energy, or salinity gradient powered desalination. Proposed technologies should advance the state of the industry and address a challenge or opportunity requiring some form of desalinated seawater, either drinking water or other water use. WPTO particularly encourages submissions that augment WPTO's existing portfolio (i.e., ideas that didn't fit, and/or have not been submitted to prior program Small Business Innovation Research (SBIRs) solicitations and FOAs – see former funding announcements list on water.energy.gov site at http://energy.gov/eere/water/water-power-closed-funding-opportunities).

Preference will be given for research that clearly links research outcomes to wider strategic WPTO Marine Energy Program aims. This means being realistic about the novelty of technical advancements as well as the assessment of proof-of-concept, prototypes, or pre-commercial demonstrations. Projects awarded are expected to pursue proof-of-concept validation of the proposed technology's principal innovation or novelty – the general expectation is that these tests be designed to prove out the assumptions of any proposal in an experimental fashion.

Proposals on all other topics in marine energy powered desalination will be considered, but the following technology development subtopics are of particular interest:

- Tidal desalination
- Blue economy applications, such as aquaculture
- Municipal-scale wave-powered desalination systems

- Components for energy transfer to shore
- Other types of desalination and / or integration with water treatment systems

TA2 Schedule, Scope, and Budget

It is imperative that the level of funding for a proposed scope of work is thoroughly justified in the application. The specific tasks, schedule, and budget should be proposed and justified by the applicant. WPTO highly encourages proposals that have targeted and meaningful outcomes within the scope of the award and therefore see suitable experimental outcomes.

Specific tasks and deliverables requirements will be negotiated with selected applicants. As applicable, DOE anticipates deliverables to include, though not be limited to, the following:

- Project management plan
- Risk management framework[17], with a particular emphasis on risks to health and safety of workers, members of the public, and the environment.
- Final report for immediate public release describing project progress, system/component performance, lessons learned, opportunities identified for further improvement, and next steps in technology development and commercialization.
- For analysis tools and/or design software development, patents, code, and use cases should be provided in addition to any technical reports, as well as appropriate resources for practitioners or users of product.
- Project technical data as it becomes available and relevant public reports and academic publications uploaded to appropriate marine energy data repository (see Appendix G), as negotiated with and agreed to by DOE.
- A report summarizing data gathered and data made immediately publicly available via the appropriate marine energy data repository (see Appendix G) as it becomes available, as negotiated with, and agreed to by DOE.

TA2 Data Reporting and Performance Metrics

A central part of TA2 projects is advancing technologies that advance the marine energy industry at large. To this end, applicants must identify key project performance metrics that will be validated or improved over the course of the project. Applicants must clearly describe the performance metrics for their project and why the metric is relevant and important. Note that marine energy

[17] Marine and Hydrokinetic Technology Development Risk Management Framework (URL: https://www.nrel.gov/docs/fy15osti/63258.pdf)

technical data should not be confused with the Data Management Plan required in Section IV.D.xiv.

Appendix F presents an extensive list of data that TA2 projects should consider measuring.

TA2 National Laboratory Support / Partnership
Collaboration with NREL is encouraged. DOE has allocated funding outside of this FOA for NREL to support FOA awardees. Accordingly, applicants do not need to reserve budget to pay for NREL's support out of their awarded project, though applicants should account for staff resources needed to inform and support activities undertaken with NREL in the project scope and budget (e.g., applicant project team time spent working with NREL during the project). Applicants are **NOT** allowed to communicate with NREL staff about laboratory support on this FOA before FOA awards are made. Instead, applicants should identify the areas in which they would benefit from NREL support in their application. The types of support available are described below. For awarded projects, the details and scope of the support that will be provided will be finalized during award negotiations between the awardee, DOE, and the institution/s providing support. *Questions regarding NREL capabilities should be submitted to the FOA mailbox.*

Applicants are strongly encouraged to leverage the capabilities of NREL in the following areas:

- Lab Testing and Validation – NREL's Flatirons Campus near Superior, Colorado, can provide end-to-end testing capabilities. Facilities and equipment available to FOA awardees include a small wave tank, large amplitude motion platform, range of dynamometers, and 3D printers, among others.
- Accredited Measurements – Awardees are encouraged to work with NREL to leverage NREL's ISO/IEC 17025 accreditation to perform accredited testing to IEC TC 114 standards. Accredited test results can be used for device certification and to demonstrate system viability to project financiers and insurance companies. The ISO/IEC 17025 accreditation confirms that NREL has the quality assurance procedures in place and the expertise to provide high-quality testing more broadly.

In addition, applicants can request R&D support from NREL in areas where each institution has expertise, as identified on the institution's websites:

- NREL: https://www.nrel.gov/water/marine-energy.html

The specific areas in which applicants are encouraged to work with NREL include:

- Wave modeling;
- Wave measurements and site characterization;
- Wave and site data analysis;
- Support designing and fabricating to IEC Technical Specifications;
- Mooring system design and analysis;
- Component and material reliability analysis and testing;
- Development and implementation of risk management strategy;
- Open water testing support and laboratory testing support;
- System performance and loads modeling;
- Extreme event modeling;
- Structural design support;
- High fidelity modeling using computational fluid dynamics (CFD) and finite element analysis (FEA) modeling;
- System design optimization;
- LCOE modeling and analysis;
- Control systems engineering consultation; and
- Installation, operations, maintenance, and decommissioning (IOM&D) planning and execution

NREL support cannot be leveraged to procure or fabricate the WEC system, system components (e.g., moorings and anchors), or to pay for IOM&D activities. NREL support can be leveraged to procure, fabricate, and deploy data acquisition systems, and testing instrumentation.

Topic Area 3: Ocean Current Test Facility Feasibility Assessment

To potentially support the testing of Marine Energy Current Energy Converters (CECs) in the open ocean, the Water Power Technologies Office intends to evaluate potential site locations, designs, and estimated costs for an ocean current test facility located off the coast of the United States. It is expected that a viable grid-connected facility will be capable of testing a variety of prototype CECs to advance reliable, low cost, renewable energy alternatives to fossil fuel. Prototype testing is essential to mature existing technologies, validate performance against analytic models, demonstrate compliance with applicable design standards and mitigate the technical and financial risk of developing projects for the utility grid market.

Construction and operation of an ocean current test facility will assist the U.S. industry to advance device and mooring system designs necessary for commercial deployment. Ultimately, this new testing capability will improve the country's competitiveness in marine energy (ME) technology, encourage

domestic manufacturing, and job creation while helping to achieve the nation's energy goals.

The project shall include both an interim detailed project review at a logical point in the project proposed by the developer, and a final detailed project review with subject matter experts of all deliverables. The developer should include time and budget in their project in support of these reviews. The interim detailed project review shall include a status update on each deliverable listed below, with draft versions provided for review and discussion as appropriate. The final detailed project review shall address any feedback provided during the interim detailed project review, with comments addressed in the final deliverables.

Deliverables from this project shall include:

1. Definition of complete system requirements to include, but not limited to: cable systems, environmental monitoring, device performance monitoring, data acquisition, and grid interconnection requirements. The scope of the system should include everything from connection to the offshore test article to the grid connection, including utility substation connection options
2. Estimated costs and schedule for facility design and construction. The estimates must quantify the uncertainty in costs to reflect potential supply chain and inflation issues. The facility should have a final rated test capacity ≥ 10 MW which should be used to determine the number of test berths as well as power system operating parameters and basic export cable specifications.
3. Scope of work and estimated costs should include those necessary to ensure NEPA compliance (Environmental Assessment or Environmental Impact Assessment as appropriate), biological assessments, permitting activities, and environmental monitoring for both species of concern and physical oceanographic processes like energy transport. Also include any expected windows of expected facility shut down due to events such as endangered species migration.
4. Estimated annual operating and maintenance costs for the facility to include costs for device as well as anchoring/mooring system installation. Include all assumptions associated with these estimates, and an analysis of different design alternatives, e.g. does the design assume that the anchors, moorings and umbilical cables will be provided by the developers and installed and removed with each device or would these sub-systems be provided by the facility and installed for the life of the project. Discussion of assumptions should include all requirements for installation and removal devices and equipment, e.g. requirements for offshore vessel, divers, etc.

5. Specific coordinates and resource characterization for proposed test location to include site conditions relevant to project design, e.g., ocean current velocity characterization, bottom type, and water depth, resource variability and potential for localized flow reversals.
6. Report describing geotechnical surveys required, with associated estimated costs and number/depth of core samples that may need to be collected, required for installation of anchors and cables at test facility.
7. Detailed risk assessment of ability to permit the facility to include analytical assessment of potential impacts to the environment. Risk assessment shall include, but is not limited to, potential impacts to known species of concern and commercially important species in the area of interest, known critical or protected habitats, potential changes to oceanographic systems such as flow patterns of the ocean currents, and potential conflicts with existing ocean uses. The risk assessment shall detail how these concerns are addressed in the preliminary design.
8. Detailed permitting plan that identifies all federal, state and local permits and/or licenses required for test site construction and operation. The permitting plan should also include anticipated timelines for when permitting activities would occur. The permitting plan should include unique challenges associated with specific CEC archetypes. The facility should be capable of testing all CEC archetypes (e.g. Axial Flow Turbine, Cross Flow Turbine, Reciprocating Devices, and Ocean Kite systems).
9. Detailed discussion of potential Marine Spatial Planning (MSP) issues concerning facility construction and operation to include summary of stakeholder concerns from federal, state, and local organizations, e.g. Department of Defense, Department of Transportation, Department of Commerce, Department of Interior, and local offshore fishing industry groups.
10. Evaluation of ME industry utilization of the facility.
11. Preliminary analysis of alternatives that were considered for achieving the project objectives, and recommended option with rationale for selection. This preliminary design shall include:
    a. Technical design considerations and assumptions
    b. Facility floorplan sketches and preliminary plans for outdoor space available for developers to utilize for equipment storage
    c. Ocean and terrestrial property boundaries to include subsea and terrestrial cable corridors.
    d. Specific coordinates and site conditions relevant to project design, e.g., ocean current velocity characterization, bottom type, and water depth.
    e. Description of nearby transportation capabilities, port facilities, utility substations, or other infrastructure as appropriate.

f. Description of environmental monitoring plans and justifications for chosen instrumentation and methodologies.

The proposed facility can be new construction or involve the design and modification of an existing facility. Infrastructure available for transporting, handling, installing, and servicing components and equipment, as well as proximity to a grid connection, should be factors in site selection. It is envisioned that the facility will have access to sufficient office space for permanent staff and visiting users. The proposed site should also have access to spaces for assembly and disassembly of test articles prior to testing. No physical measurements of oceanographic or geotechnical parameters are expected to be performed by the developer as part of this feasibility study.

Minimum Resource & Infrastructure Requirements

Any proposed test site and accompanying facility support infrastructure must meet or exceed the following site location & resource requirements:

- Located within U.S. Exclusive Economic Zone[18]; and
- Ocean current average speed > 1.5 m/sec

All work under EERE funding agreements must be performed in the United States. See Section IV.K.iii. and Appendix B.

C. Applications Specifically Not of Interest

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D. of the FOA):

- Applications that fall outside the technical parameters specified in Section I.A. and I.B. of the FOA.
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Applications which seek to optimize sub-systems or components without significant contribution to improving overall system performance.

D. Authorizing Statutes

The programmatic authorizing statute is:

Section 635 of the Energy Independence and Security Act of 2007 (EISA), Public Law 110-140. Codified at 42 U.S.C. 17214. Marine Energy research, development and demonstration..

[18] 33 CFR Part 2. (URL: https://www.ecfr.gov/current/title-33/chapter-I/subchapter-A/part-2)

Awards made under this announcement will fall under the purview of 2 Code of Federal Regulation (CFR) Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make a total of approximately $10,300,000 of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making up to 14 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between $300,000 and $2,125,000.

EERE may issue awards in one, multiple, or none of the following topic areas:

Topic Area Number and Title	Anticipated Number of Awards	Anticipated Minimum Award Size for Any One Individual Award (Fed Share)	Anticipated Maximum Award Size for Any One Individual Award (Fed Share)	Approximate Total Federal Funding Available for All Awards	Anticipated Number of Budget Periods	Anticipated Period of Performance (months)
1. Wave Powered Systems Innovation at Sea	Up to 10	$500,000	$2,125,000	$8,500,000	2	12 to 48
2. Open Topic Area (Marine Energy Powered Desalination)	Up to 2	$500,000	$1,000,000	$1,000,000	1-2	12 to 48
3. Ocean Current Test Facility Feasibility Assessment	1-2	$400,000	$800,000	$800,000	1	18 to 24

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

ii. Period of Performance

EERE anticipates making awards that will run from 12 months up to 48 months in length and comprised of one or more budget periods (see table below for specific information for each topic area). Project continuation will be contingent upon several elements, including satisfactory performance and Go/No-Go decision review. For a complete list, see Section VI.B.xiv. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, the extent milestone objectives are met, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

iii. New Applications Only

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE Funding Agreements

Through cooperative agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States government.

i. Cooperative Agreements

EERE generally uses cooperative agreements to provide financial and other support to prime recipients.

Through cooperative agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by federal statute. Under cooperative agreements, the government and prime recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via cooperative agreement. See Section VI.B.ix of the FOA for more information on what substantial involvement may involve.

ii. Funding Agreements with Federally Funded Research and Development Center (FFRDCs)

In most cases, FFRDCs are funded independently of the remainder of the project team. The FFRDC then executes an agreement with any non-FFRDC project team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project.

III. Eligibility Information

To be considered for substantive evaluation, an applicant's submission must meet the criteria set forth below. If the application does not meet these eligibility requirements, it will be considered ineligible and removed from further evaluation.

A. Eligible Applicants

i. Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a prime recipient or subrecipient.

ii. Domestic Entities

For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States and have a physical location for business operations in the United States are eligible to apply for funding as a prime recipient or subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995 are not eligible to apply for funding.

State, local, and tribal government entities are eligible to apply for funding as a prime recipient or subrecipient.

DOE/NNSA FFRDCs are eligible to apply for funding based on Topic Area as described below:

Topic Areas 1 & 2: DOE/NNSA FFRDCs/National Laboratories are NOT eligible to apply as prime recipients. DOE/NNSA FFRDCs/National Laboratories (except the National Renewable Energy Laboratory (NREL)) may apply as subrecipients;

Topic Area 3: DOE/NNSA FFRDCs/National Laboratories are NOT eligible to apply as prime recipents or subrecipients;

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

iii. Foreign Entities

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA. Other than as provided in the "Individuals" or "Domestic Entities" sections above, all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a state or territory of the United States and have a physical location for business operations in the United States. If a foreign entity applies for funding as a prime recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a state or territory of the United States to be the prime recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

Foreign entities may request a waiver of the requirement to designate a subsidiary in the United States as the prime recipient in the Full Application (i.e., a foreign entity may request that it remains the prime recipient on an award). To do so, the applicant must submit an explicit written waiver request in the Full Application. Appendix B lists the necessary information that must be included in a request to waive this requirement. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

In the waiver request, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. EERE may require additional information before considering the waiver request.

A foreign entity may receive funding as a subrecipient.

iv. Incorporated Consortia

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a prime recipient or subrecipient. For consortia incorporated (or otherwise formed) under the laws of a state or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated in foreign countries, please refer to the requirements in "Foreign Entities" above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

v. Unincorporated Consortia

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the prime recipient/consortium representative. The prime recipient/consortium representative must be incorporated (or otherwise formed) under the laws of a state or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the prime recipient/consortium representative under Section III.A. of the FOA.

Upon request, unincorporated consortia must provide the EERE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. Cost Sharing

1. For institutions of higher education and non-profit organizations:
Cost sharing is not required under this FOA, 0%.

Section 10725 of the Research and Development, Competition, and Innovation Act, P.L. 117-167 (Aug. 9, 2022) extends the cost share waiver pilot program enacted by Section 108 of the Department of Energy Research and Innovation Act, Public Law 115–246 (Innovation Act) and provides an exemption for institutions of higher education and non-profit organizations from the 20% cost share requirement for Research and Development activities. The exemption is available for the two-year period beginning on August 9, 2022. Codified at 42 U.S.C 16352.

2. For all other entities:
The cost share must be at least 20% of the total allowable costs for research and development projects (i.e., the sum of the government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendix A to this FOA.

i. Legal Responsibility

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the prime recipient, the prime recipient is legally responsible for paying the entire cost share. If the funding agreement is terminated prior to the end of the project period, the prime recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The prime recipient is solely responsible for managing cost share contributions by the project team and enforcing cost share obligation assumed by project team members in subawards or related agreements.

ii. Cost Share Allocation

Each project team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual project team members may vary, as long as the cost share requirement for the project as a whole is met.

iii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable federal cost principles, as described in Section IV.K.i. of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the prime recipient, subrecipients, or third parties (entities that do not have a role in performing the scope of work). Vendors/contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

Cash contributions include, but are not limited to: personnel costs, fringe costs, supply and equipment costs, indirect costs and other direct costs.

In-kind contributions are those where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. Allowable in-kind contributions include, but are not limited to: the donation of volunteer time or the donation of space or use of equipment.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the federal government.

The prime recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., federal grants, equipment owned by the federal government); or
- Expenditures that were reimbursed under a separate federal program.

Project teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the prime recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same federal regulations as federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 for additional cost sharing requirements.

iv. Cost Share Contributions by FFRDCs

Because FFRDCs are funded by the federal government, costs incurred by FFRDCs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-federal source.

v. Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix A of the FOA.

vi. Cost Share Payment

EERE requires prime recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the prime recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated). As FFRDC funding will be provided directly to the FFRDC(s) by DOE, prime recipients will be required to provide project cost share at a percentage commensurate with the FFRDC costs, on a budget period basis, resulting in a higher interim invoicing cost share ratio than the total award ratio.

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the prime recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the prime recipient must be up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the prime recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

Concept Papers, Full Applications, and Replies to Reviewer Comments must meet all compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, including Concept Papers, Full Applications, and Replies to Reviewer Comments that were: submitted through means other than EERE eXCHANGE; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information by the applicable deadline due to server/connection congestion.

i. Compliance Criteria

i. Concept Papers

Concept Papers are deemed compliant if:

- The Concept Paper complies with the content and form requirements in Section IV.C. of the FOA; and
- The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE eXCHANGE by the deadline stated in this FOA.

ii. Full Applications

Full Applications are deemed compliant if:

- The applicant submitted a compliant Concept Paper;
- The Full Application complies with the content and form requirements in Section IV.D. of the FOA; and
- The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE eXCHANGE by the deadline stated in the FOA.

iii. Replies to Reviewer Comments

Replies to Reviewer Comments are deemed compliant if:

- The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E. of the FOA; and
- The applicant successfully uploaded all required documents to EERE eXCHANGE by the deadline stated in the FOA.

D. Responsiveness Criteria

All "Applications Specifically Not of Interest," as described in Section I.C. of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. Other Eligibility Requirements

i. Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a subrecipient on another entity's application subject to the following guidelines:

i. Authorization for non-DOE/NNSA FFRDCs

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

ii. Authorization for DOE/NNSA FFRDCs

The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

Authorization is granted for the Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

iii. Value/Funding

The value of and funding for the FFRDC portion of the work will not normally be included in the award to a successful applicant. Usually, DOE will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal (WP) system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

iv. Cost Share

Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement will be based on the total cost of the project, including the applicant's, the subrecipient's, and the FFRDC's portions of the project.

v. Responsibility

The prime recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the prime recipient and the FFRDC contractor.

vi. Limit on FFRDC Effort

The scope of work to be performed by the FFRDC may not be more significant than the scope of work to be performed by the applicant.

F. Limitation on Number of Concept Papers and Full Applications Eligible for Review

An entity may submit more than one Concept Paper and Full Application to this FOA, provided that each application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Full Application.

G. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**.

At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III. of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE eXCHANGE at https://eere-eXCHANGE.energy.gov, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE eXCHANGE, submissions submitted after the applicable deadline, or incomplete submissions**. EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion.

A **Control Number** will be issued when an applicant begins the EERE eXCHANGE application process. This control number must be included with all application documents, as described below.

The Concept Paper, Full Application, and Reply to Reviewer Comments must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise;
- Each must be written in English;
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Calibri typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;

- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers, Full Applications, and Replies to Reviewer Comments at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a, Concept Paper, Full Application, or Reply to Reviewer Comments. Once the Concept Paper, Full Application, or Reply to Reviewer Comments is submitted in EERE eXCHANGE, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made to any of these documents, the applicant must resubmit the Concept Paper, Full Application, or Reply to Reviewer Comments before the applicable deadline.

EERE urges applicants to carefully review their Concept Papers, Full Applications, and Replies to Reviewer Comments to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.ii. of the FOA.

i. Additional Information on EERE eXCHANGE

EERE eXCHANGE is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE eXCHANGE, the following information may be helpful.

Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an applicant experiences technical difficulties with a submission, the applicant should contact the EERE eXCHANGE helpdesk for assistance (EERE-eXCHANGESupport@hq.doe.gov). The EERE eXCHANGE helpdesk and/or the EERE eXCHANGE system administrators will assist applicants in resolving issues.

B. Application Forms

The application forms and instructions are available on EERE eXCHANGE. To access these materials, go to https://eere-eXCHANGE.energy.gov and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE eXCHANGE website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:
TechnicalVolume_Part_1
TechnicalVolume_Part_2

C. Content and Form of the Concept Paper

To be eligible to submit a Full Application, applicants must submit a Concept Paper by the specified due date and time.

i. Concept Paper Content Requirements

EERE will not review or consider ineligible Concept Papers (see Section III. of the FOA).

Each Concept Paper must be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated into a single Concept Paper.

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific announcement Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technology Description	3 pages maximum	Applicants are required to describe succinctly: • The proposed technology, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (applicants should provide technical data or other support to show how the proposed target could be met); • The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, and challenges;

		• How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project. • Applicants may provide graphs, charts, or other data to supplement their Technology Description within the allowed page limit.
Addendum	2 pages maximum	Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including: • Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; • Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the applicant has worked together with its teaming partners on prior projects or programs; and • Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities. • Applicants may provide graphs, charts, or other data to supplement their Technology Description within the allowed page limit.

EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i. of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a "discouraged" notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

EERE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notification posted on EERE eXCHANGE at the close of that phase.

D. Content and Form of the Full Application

Applicants must submit a Full Application by the specified due date and time to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE eXCHANGE website at https://eere-eXCHANGE.energy.gov/, in accordance with the instructions.

Applicants will have approximately 30 days from receipt of the Concept Paper Encourage/Discourage notification on EERE eXCHANGE to prepare and submit a Full Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.

All Full Application documents must be marked with the Control Number issued to the applicant. Applicants will receive a control number upon clicking the "Create Concept Paper" button in EERE eXCHANGE, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*).

i. Full Application Content Requirements

EERE will not review or consider ineligible Full Applications (see Section III. of the FOA).

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application. Full Applications must conform to the following requirements:

Component	File Format	Page Limit	File Name
Technical Volume	PDF	30	ControlNumber_LeadOrganization_TechnicalVolume
Resumes	PDF	3 pages each	ControlNumber_LeadOrganization_Resumes
Letters of Commitment	PDF	1 page each	ControlNumber_LeadOrganization_LOCs
Statement of Project Objectives	MS Word	15	ControlNumber_LeadOrganization_SOPO
SF-424	PDF	n/a	ControlNumber_LeadOrganization_App424
Budget Justification Workbook	MS Excel	n/a	ControlNumber_LeadOrganization_Budget_Justification
Summary/Abstract for Public Release	PDF	1	ControlNumber_LeadOrganization_Summary
Summary Slide	MS Powerpoint	1	ControlNumber_LeadOrganization_Slide

Subrecipient Budget Justification	MS Excel	n/a	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
DOE Work Proposal for FFRDC, if applicable (see DOE O 412.1A, Attachment 3)	PDF	n/a	ControlNumber_LeadOrganization_WP
Authorization from cognizant Contracting Officer for FFRDC	PDF	n/a	ControlNumber_LeadOrganization_FFRDCAuth
SF-LLL Disclosure of Lobbying Activities	PDF	n/a	ControlNumber_LeadOrganization_SF-LLL
Foreign Entity and Foreign Work Waivers	PDF	n/a	ControlNumber_LeadOrganization_Waiver
Diversity Equity and Inclusion Plan	MS Word	3	ControlNumber_LeadOrganization_DEIP
Current and Pending Support	PDF	n/a	ControlNumber_LeadOrganization_CPS
Cost Breakdown Structure	MS Excel	n/a	ControlNumber_LeadOrganization_CBS
TRL Categorization	PDF	2	ControlNumber_LeadOrganization_TRL Categorization
Site Assessment Questionnaire	PDF	5	ControlNumber_LeadOrganization_Site_Assessment

Note: The maximum file size that can be uploaded to the EERE eXCHANGE website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:
TechnicalVolume_Part_1
TechnicalVolume_Part_2

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

ii. Technical Volume

The Technical Volume must be submitted in PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.ii. of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical

Volume. However, EERE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 30 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii. of the FOA) when preparing the Technical Volume. Use of images to communicate design and device function and goals is encouraged.

The Technical Volume should clearly describe and expand upon information provided in the Concept Paper. The Technical Volume must conform to the following content requirements:

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific FOA Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, names of the senior/key personnel and their organizations, and any statements regarding confidentiality.
Project Overview (Approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.

Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful.
Workplan and Market Transformation Plan (Approximately 40% of the Technical Volume)	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to

	describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. See Section VI.B.xiv. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/No-Go decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone. • End of Project Goal: The applicant should provide a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO. • Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points. • Project Management: The applicant should discuss the team's proposed management plan, including the following: ○ The overall approach to and organization for managing the work

	○ The roles of each project team member ○ Any critical handoffs/interdependencies among project team members ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices ○ The approach to project risk management ○ A description of how project changes will be handled ○ If applicable, the approach to Quality Assurance/Control ○ How communications will be maintained among project team members • Market Transformation Plan: The applicant should provide a market transformation plan, including the following: ○ Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan ○ Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, and product distribution.
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the project team's unique qualifications and expertise, including those of key subrecipients. • Describe the project team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. • For multi-organizational or multi-investigator projects, describe succinctly:

	○ The roles and the work to be performed by each PI and senior/key personnel; ○ Business agreements between the applicant and each PI and senior/key personnel; ○ How the various efforts will be integrated and managed; ○ Process for making decisions on scientific/technical direction; ○ Publication arrangements; ○ Intellectual Property issues; and ○ Communication plans
Topic Area 1A Specific Technical Requirements (Estimated approximately 10 pages to meet these requirements)	• Existing design drawings, schematic diagrams, 3D models, renderings or other relevant representations • (Anchoring/mooring/station keeping strategy with description based on proposed site selection plus any descriptive drawings or modeling simulations to understand design assumptions or expected performance. (Suggested ½ -1 page in length) • Overview of marine operations & installation (recommend description and/or visual storyboard) • Describe data collection and measurement as described in section TA1 Required Measurement and Data Reporting
Topic Area 1B Specific Technical Requirements (Estimated 3 pages to meet these requirements)	• Describe any relevant partnership strategies with wave energy developers, manufactures, desalination and water technology companies, etc.

iii. Resumes

A resume provides information that can be used by reviewers to evaluate the individual's skills, experience, and potential for leadership within the scientific community. Applicants are required to submit three-page resumes for the Principal Investigator and all Senior/Key Personnel that include the following:

1. Contact Information;
2. Education and training: Provide institution, major/area, degree, and year for undergraduate, graduate, and postdoctoral training;
3. Research and Professional Experience: Beginning with the current position, list professional/academic positions in chronological order with a brief description. List all current academic, professional, or institutional appointments, foreign or domestic, at the applicant institution or elsewhere, whether or not remuneration is received, and, whether full-time, part-time, or voluntary;

4. Awards and honors;
5. A list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights, and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors; and
6. Synergistic Activities: List up to five professional and scholarly activities related to the proposed effort.

Save the resumes in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Resumes".

In future FOAs, EERE may require a biographical sketch for the PI and senior/key personnel. In the meantime, in lieu of a resume, it is acceptable to use the biographical sketch format approved by the National Science Foundation (NSF). The biographical sketch format may be generated by the Science Experts Network Curriculum Vita (SciENcv), a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/, and is also available at https://nsf.gov/bfa/dias/policy/nsfapprovedformats/biosketch.pdf. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

iv. Letters of Commitment

Submit letters of commitment from all subrecipient and third party cost share providers. If applicable, also include any letters of commitment from partners/end users (one-page maximum per letter). Save the letters of commitment in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_LOCs".

v. Statement of Project Objectives (SOPO)

Applicants are required to complete a SOPO. A SOPO template is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. The SOPO, including the Milestone Table, must not exceed 15 pages when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point (except in figures or tables, which may be 10 point font). Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO". Applicants for topic area 1 are encouraged to refer to section I.B for project scope and schedule guidelines.

vi. SF-424: Application for Federal Assistance

Applicants are required to complete the SF-424 Application for Federal Assistance. This form is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_424".

vii. Budget Justification Workbook

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. Prime recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

viii. Summary/Abstract for Public Release

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made. The project summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

ix. Summary Slide

Applicants are required to provide a single slide summarizing the proposed project. This slide is used during the evaluation process.

The Summary Slide template requires the following information:

- A technology summary;
- A description of the technology's impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);
- The project's key idea/takeaway;
- Project title, prime recipient, Principal Investigator, and senior/key personnel information; and
- Requested EERE funds and proposed applicant cost share.

Save the Summary Slide in a single Microsoft Powerpoint file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

x. Subrecipient Budget Justification (if applicable)

Applicants must provide a separate budget justification for each subrecipient that is expected to perform work estimated to be more than $250,000 or 25 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the "Budget Justification" section above. Save each subrecipient budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subrecipient_Budget_Justification".

xi. Budget for DOE/NNSA FFRDC (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE WP in accordance with the requirements in DOE Order 412.1A, Work Authorization System, Attachment 3, available at: https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a-chg1-AdmChg Save the WP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_WP".

xii. Authorization for non-DOE/NNSA or DOE/NNSA FFRDCs (if applicable)

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file

using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

xiii. SF-LLL: Disclosure of Lobbying Activities (required)

Prime recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_SF-LLL".

xiv. Waiver Requests: Foreign Entity and Foreign Work (if applicable)

i. **Foreign Entity Participation:**
As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix B lists the necessary information that must be included in a request to waive this requirement.

ii. **Performance of Work in the United States (Foreign Work Waiver)**
As set forth in Section IV.J.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. Appendix B lists the necessary information that must be included in a foreign work waiver request.

Save the Waivers in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Waiver".

xv. Diversity, Equity and Inclusion Plan

As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a Diversity, Equity, and Inclusion Plan that describes the actions the applicant will take to foster a welcoming and inclusive environment, support people from groups underrepresented in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in or benefit underserved communities (also see Section I.A.iii.). The plan should include at least one SMART milestone per Budget Period supported by metrics to measure the success of the proposed actions, and will be incorporated into the award if selected. The Diversity, Equity, and Inclusion Plan should contain the following information:

- Equity Impacts: the impacts of the proposed project on underserved communities, including social and environmental impacts.
- Benefits: The overall benefits of the proposed project, if funded, to underserved communities; and
- How diversity, equity, and inclusion objectives will be incorporated in the project.

The following is a non-exhaustive list of actions that can serve as examples of ways the proposed project could incorporate diversity, equity, and inclusion elements. These examples should not be considered either comprehensive or prescriptive. Applicants may include appropriate actions not covered by these examples.

a. Include persons from groups underrepresented in STEM as PI, co-PI, and/or other senior personnel;
b. Include persons from groups underrepresented in STEM as student researchers or post-doctoral researchers;
c. Include faculty or students from Minority Serving Institutions as PI/co-PI, senior personnel, and/or student researchers, as applicable;
d. Enhance or collaborate with existing diversity programs at your home organization and/or nearby organizations;
e. Collaborate with students, researchers, and staff in Minority Serving Institutions;
f. Disseminate results of research and development in Minority Serving Institutions or other appropriate institutions serving underserved communities;

g. Implement evidence-based, diversity-focused education programs (such as implicit bias training for staff) in your organization;
h. Identify Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses and Veteran Owned Businesses to solicit as vendors and sub-contractors for bids on supplies, services and equipment.

The Diversity, Equity, and Inclusion Plan must not exceed 3 pages. Save the Diversity, Equity and Inclusion Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_DEIP".

xvi. Current and Pending Support

Current and pending support is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support. As part of the application, the principal investigator and senior/key personnel at the applicant and subrecipient level must provide a list of all sponsored activities, awards, and appointments, whether paid or unpaid; provided as a gift with terms or conditions or provided as a gift without terms or conditions; full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or in-kind; foreign or domestic; governmental or private-sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. All foreign government-sponsored talent recruitment programs must be identified in current and pending support.

For every activity, list the following items:

- The sponsor of the activity or the source of funding
- The award or other identifying number
- The title of the award or activity. If the title of the award or activity is not descriptive, add a brief description of the research being performed that would identify any overlaps or synergies with the proposed research
- The total cost or value of the award or activity, including direct and indirect costs and cost share. For pending proposals, provide the total amount of requested funding
- The award period (start date – end date)
- The person-months of effort per year being dedicated to the award or activity

If required to identify overlap, duplication of effort, or synergistic efforts, append a description of the other award or activity to the current and pending support.

Details of any obligations, contractual or otherwise, to any program, entity, or organization sponsored by a foreign government must be provided on request to either the applicant institution or DOE.

PIs and senior/key personnel must provide a separate disclosure statement listing the required information above regarding current and pending support. Each individual must sign and date their respective disclosure statement and include the following certification statement:

> I, [Full Name and Title], certify to the best of my knowledge and belief that the information contained in this Current and Pending Support Disclosure Statement is true, complete and accurate. I understand that any false, fictitious, or fraudulent information, misrepresentations, half-truths, or omissions of any material fact, may subject me to criminal, civil or administrative penalties for fraud, false statements, false claims or otherwise. (18 U.S.C. §§ 1001 and 287, and 31 U.S.C. 3729-3730 and 3801-3812). I further understand and agree that (1) the statements and representations made herein are material to DOE's funding decision, and (2) I have a responsibility to update the disclosures during the period of performance of the award should circumstances change which impact the responses provided above.

The information may be provided in the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vita (SciENcv), a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/, and is also available at https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats. If the NSF format is used, the individual must still include a signature, date, and a certification statement using the language included in the paragraph above.

Save the Current and Pending Support in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_CPS".

xvii. Cost Breakdown Structure

Applicants for Topic Areas 1 and 2 must submit a cost breakdown structure for their proposed technology. A cost breakdown structure suggested template is available on EERE eXCHANGE at https://eere-Exchange.energy.gov/

xviii. Technology Readiness Assessment

Applicants for Topic Areas 1 and 2 must submit a technology readiness level categorization for their technology. This categorization form provides applicants space to identify the TRL of their system or component and justify their TRL

assessment based on experimental testing, field deployments, or other applicable means. TRL Categorization submissions should be no more than 2 pages in length when submitted. A TRL categorization suggested template is available on the EERE Exchange at https://eere-Exchange.energy.gov/

xix. Site Assessment Questionnaire

Applicants for Topic Areas 1 and 2 must submit a Site Assessment Questionnaire for their proposed testing location. This assessment form provides applicants an opportunity to outline technical aspects of their chosen/planned test location. Site Assessment Questionnaire's should be no more than 5 pages in length when submitted. A Site Assessment Questionnaire suggested template is available on the EERE Exchange at https://eere-Exchange.energy.gov/

E. Content and Form of Replies to Reviewer Comments

If replies to reviewer comments are applicable, EERE will provide applicants with reviewer comments following the evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to the comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to submit a Reply to Reviewer Comments. EERE will post the Reviewer Comments in EERE eXCHANGE. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor EERE eXCHANGE in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check EERE eXCHANGE or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III. of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more than three (3) pages in length, EERE will review only the first three (3) pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.

Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

F. Post Selection Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information regarding the following (non-exhaustive list):

- Personnel proposed to work on the project and collaborating organizations (See Section VI.B.xviii. Participants and Collaborating Organizations);
- Current and Pending Support (See Sections IV.E.xvii and VI.B.xix. Current and Pending Support);
- An Intellectual Property Management Plan (if applicable) describing how the project team/consortia members will handle intellectual property rights and issues between themselves while ensuring compliance with federal intellectual property laws, regulations, and policies in accordance with VI.B.x Intellectual Property Management Plan;
- A Data Management Plan (if applicable) describing how all research data displayed in publications resulting from the proposed work will be digitally accessible at the time of publications, in accordance with Section VI.B.xxi.;
- Indirect cost information;
- Other budget information;
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable;
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5);
- Representation of Limited Rights Data and Restricted Software, if applicable;
- Environmental Questionnaire; and
- Software developed under this award is not required to be Open Source Software (OSS). However, if OSS is determined to be part of the award project, additional information will be required during award negotiations regarding a distribution plan for the OSS.

G. Unique Entity Identifier (UEI) and System for Award Management (SAM)

Each applicant (unless the applicant is an individual or federal awarding agency that is excepted from those requirements under 2 CFR 25.110(b) or (c), or has an exception approved by the federal awarding agency under 2 CFR 25.110(d)) is required to: (1) Be registered in the SAM at https://www.sam.gov before submitting its application; (2) provide a valid UEI in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active federal award or an application or plan under consideration by a federal

awarding agency. DOE may not make a federal award to an applicant until the applicant has complied with all applicable UEI and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, the DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process. Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process they should utilize the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: GSAFSD Tier 0 Knowledge Base - Validating your Entity.

H. Submission Dates and Times

All required submissions must be submitted in EERE eXCHANGE no later than 5 p.m. Eastern Time on the dates provided on the cover page of this FOA.

I. Intergovernmental Review

This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

One of the objectives of the Executive Order is to foster an intergovernmental partnership and a strengthened federalism. The Executive Order relies on processes developed by state and local governments for coordination and review of proposed federal financial assistance.

Applicants should contact the appropriate State Single Point of Contact (SPOC) to find out about, and comply with, the state's processes under Executive Order 12372. The deadline for Intergovernmental Review is [Select Date].

J. Funding Restrictions

i. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable federal cost principles.

Refer to the following applicable federal cost principles for more information:

- Federal Acquisition Regulation (FAR) Part 31 for For-Profit entities; and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

ii. Pre-Award Costs

Selectees must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the federal award directly pursuant to the negotiation and in anticipation of the federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the federal award and **only** with the written approval of the federal awarding agency, through the Contracting Officer assigned to the award.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis.

Pre-award expenditures are made at the selectee's risk. EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the selectee anticipated.

1. **National Environmental Policy Act (NEPA) Requirements Related to Pre-Award Costs**

   EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

   EERE does not guarantee or assume any obligation to reimburse pre-award costs incurred prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that DOE determines may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting Officer, the applicant is doing so at risk of not receiving federal funding for their project and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA requirements to obtain the written authorization from the Contracting Officer prior to taking any action that

may have an adverse effect on the environment or limit the choice of reasonable alternatives. Likewise, if an application is selected for negotiation of award, and the prime recipient elects to undertake activities that are not authorized for federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the prime recipient is doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share.

iii. Performance of Work in the United States (Foreign Work Waiver)

1. Requirement

All work performed under EERE awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the prime recipient should make every effort to purchase supplies and equipment within the United States. The prime recipient must flow down this requirement to its subrecipients.

2. Failure to Comply

If the prime recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The prime recipient is responsible should any work under this award be performed outside the United States, absent a waiver, regardless of whether the work is performed by the prime recipient, subrecipients, contractors or other project partners.

3. Waiver

There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a foreign work waiver, the applicant must submit a written waiver request to EERE. Appendix C lists the necessary information that must be included in a request for a foreign work waiver.

The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

v. Foreign Travel

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs are allowable only with the written prior approval of the Contracting Officer assigned to the award.

vi. Equipment and Supplies

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the current fair market value of property exceeds $5,000. For-profit entity disposition requirements are set forth at 2 CFR 910.360. Property disposition requirements for other non-federal entities are set forth in 2 CFR 200.310 – 200.316.

vii. Domestic Preference – Infrastructure Projects

As appropriate and to the extent consistent with law, Applicants shall ensure that, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products (items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber) used in the proposed project shall be produced in the United States. This requirement shall flow down to all sub-awards including all contracts, subcontracts and purchase orders for work performed under the proposed project.

viii. Lobbying

Recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to

ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

ix. Risk Assessment

Prior to making a federal award, the DOE is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any Office of Management and Budget (OMB)-designated repositories of government-wide eligibility qualification or financial integrity information, such as SAM Exclusions and "Do Not Pay."

In addition, DOE evaluates the risk(s) posed by applicants before they receive federal awards. This evaluation may consider: results of the evaluation of the applicant's eligibility; the quality of the application; financial stability; quality of management systems and ability to meet the management standards prescribed in this part; history of performance; reports and findings from audits; and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-federal entities.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR 180, and must require non-federal entities to comply with these provisions. These provisions restrict federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in federal programs or activities.

x. Invoice Review and Approval

DOE employs a risk-based approach to determine the level of supporting documentation required for approving invoice payments. Recipients may be required to provide some or all of the following items with their requests for reimbursement:

- Summary of costs by cost categories;
- Timesheets or personnel hours report;
- Invoices/receipts for all travel, equipment, supplies, contractual, and other costs;
- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients;

- Explanation of cost share for invoicing period;
- Analogous information for some subrecipients; and
- Other items as required by DOE.

V. Application Review Information

A. Technical Review Criteria

i. Concept Papers

Concept Papers are evaluated based on consideration the following factors. All sub-criteria are of equal weight.

TOPIC AREA 1 AND 2

Criterion 1: Overall FOA Responsiveness and Viability of the Project (Weight: 50%)

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology, describes how the technology is unique and innovative, and how the technology will advance the current state-of-the-art;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that EERE funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the FOA.

Criterion 2: Specific Contributions to the Marine Energy Desalination Industry (Weight: 50%)

This criterion involves consideration of the following factors:

- The applicant effectively demonstrates how the project will use an iterative design and test process to drive deployment-based innovation;

- The applicant clearly outlines an effective data collection plan which can benefit the marine energy desalination industry as a whole; and
- The applicant displays broader commercialization potential in the marine energy industry.

TOPIC AREA 3

Criterion 1: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology, describes how the technology is unique and innovative, and how the technology will advance the current state-of-the-art;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that EERE funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the FOA.

ii. Full Applications

Applications will be evaluated against the merit review criteria shown below. All sub-criteria are of equal weight. Criteria for full applications for each topic area is described below:

TOPIC AREA 1

Criterion 1: Technical Merit, Innovation, and Impact (50%)

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including

relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and target specifications and metrics;
- The potential impact of the project on advancing the state-of-the-art;
- Extent to which the application demonstrates how the project will use an iterative design and test process to drive deployment-based innovation;
- Extent to which in-water tests or component level testing advances system level engineering design and clearly demonstrates broad value for end-users or industry;
- Extent to which the wave energy converter and integrated desalination system design realize modularity, robustness, and survivability; and
- Extent to which the project reflects the use of novel material strategies and/or informs or otherwise incorporates relevant technical standards (e.g., International Electrotechnical Commission (IEC) standards).

Criterion 2: Project Research and Market Transformation Plan (25%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan;
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline,

financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, Open Source Software Distribution Plan, etc., and product distribution; and
- The extent and quality of understanding end-user needs and quantifying the value of marine energy in desalination markets or other emerging ocean markets uniquely suited to marine renewable energy technology.

Criterion 3: Team and Resources (15%)
This criterion involves consideration of the following factors:
- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan;
- The reasonableness of the budget and spend plan for the proposed project and objectives;
- The degree to which the proposed team has field experience with in-water testing and deployments of wave energy converters, seawater desalination, marine operations, or blue economy applications, as it relates to the stated project objectives; and
- The degree to which the proposed team has direct technical or commercial expertise with seawater desalination, or the degree to which the proposed team will leverage strategic partnerships to access this expertise.

Criterion 4: Diversity, Equity, and Inclusion (10%)
This criterion involves consideration of the following factors:
- The quality and manner in which the measures incorporate diversity, equity and inclusion goals in the project; and
- Extent to which the project benefits underserved communities.

TOPIC AREA 2
Criterion 1: Technical Merit, Innovation, and Impact (50%)
This criterion involves consideration of the following factors:
Technical Merit and Innovation
- Extent to which the proposed technology or process is innovative;

- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research and Market Transformation Plan (25%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including

intellectual property, infrastructure requirements, Open Source Software Distribution Plan, etc., and product distribution; and
- The extent and quality of understanding end-user needs and quantifying the value of marine energy in desalination markets or other emerging ocean markets uniquely suited to marine renewable energy technology.

Criterion 3: Team and Resources (15%)
This criterion involves consideration of the following factors:
- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Criterion 4: Diversity, Equity, and Inclusion (10%)
This criterion involves consideration of the following factors:
- The quality and manner in which the measures incorporate diversity, equity and inclusion goals in the project; and
- Extent to which the project benefits underserved communities.

TOPIC AREA 3
Criterion 1: Technical Merit and Impact (25%)
This criterion involves consideration of the following factors:
- Degree to which the proposed site and resource are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will assess feasibility of an ocean current test facility;
- Sufficiency of technical detail in the application to assess the proposed scope, including discussion of prior work in the literature with analyses that support the viability of the proposed work; and
- How the project supports the topic area objectives and target specifications.

Criterion 2: Project Research Plan (40%)

This criterion involves consideration of the following factors:
Research Approach, Workplan and SOPO

- Degree to which the approach, including development of the system requirements and cost estimate, and critical path have been clearly described and thoughtfully considered;
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals; and
- Quality of proposed project milestones.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas, including permitting considerations, involved in the potential construction and operation of a OCTF and the quality of the plan to develop mitigation strategies to address these risks; and
- Quality of the plan to obtain reasonable cost estimates for facility design and construction.

Metrics and Deliverables

- The level of clarity in the definition of the metrics that explain how the facility could potentially reduce Marine Energy developers' LCOE;
- The level of clarity in the metrics that will be used by the project to show progress towards achieving milestones; and
- The quality of the mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Criterion 3: Team and Resources (25%)
This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team (including any subrecipients and/or vendors);
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Criterion 4: Diversity, Equity, and Inclusion (10%)

This criterion involves consideration of the following factors:

- The quality and manner in which the measures incorporate diversity, equity and inclusion goals in the project; and
- Extent to which the project benefits underserved communities.

iii. Criteria for Replies to Reviewer Comments

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "DOE Merit Review Guide for Financial Assistance," effective September 2020, which is available at: https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current.

C. Other Selection Factors

i. Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States;
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty; and

- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
- 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.

Diversity (other than technological)

- The degree to which the proposed project collectively represents diverse types and sizes of applicant organizations.

Optimize Funding

- The degree to which the proposed project avoids duplication/overlap with other publicly or privately funded work.

Complementary Efforts

- The degree to which the proposed project supports complementary efforts or projects, which, when taken together, will best achieve the research goals and objectives.

Market Impact

- The degree to which the proposed project enables new and expanding market segments.

EE/Deployment

- The degree to which the project's solution or strategy will maximize deployment or replication.

Tech Transfer

- The degree to which the project promotes increased coordination with nongovernmental entities for demonstration of technologies and research applications to facilitate technology transfer.

D. Evaluation and Selection Process

i. Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject

matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

ii. Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews for TAs 1 & 2. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See Section V.D.iii. of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits at certain applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that applicants have been selected for award negotiations.

iii. Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

The information provided by applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

iv. Recipient Integrity and Performance Matters

DOE, prior to making a federal award with a total amount of federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards when completing the review of risk posed by applicants as described in 2 CFR 200.206.

v. Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

E. Anticipated Notice of Selection and Award Negotiation Dates

EERE anticipates notifying applicants selected for negotiation of award and negotiating awards by the dates provided on the cover page of this FOA.

VI. Award Administration Information

A. Award Notices

i. Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE eXCHANGE. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

ii. Concept Paper Notifications

EERE will notify applicants of its determination to encourage or discourage the submission of a Full Application. EERE will post these notifications to EERE eXCHANGE.

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing a Full Application that is unlikely to be selected for award negotiations.

A notification encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.J.ii. of the FOA for guidance on pre-award costs.

iii. Full Application Notifications

EERE will notify applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE eXCHANGE. The notification letter will inform the applicant whether or not its Full Application was selected for award negotiations. Alternatively, EERE may notify one or more applicants that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

iv. Successful Applicants

Receipt of a notification letter selecting a Full Application for award negotiations does not authorize the applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment by EERE to issue an award. Applicants do not receive an award until award negotiations are

complete and the Contracting Officer executes the funding agreement, accessible by the prime recipient in FedConnect.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE eXCHANGE with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.J.ii. of the FOA for guidance on pre-award costs.

v. Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for federal funding in the future. A notification letter stating the Full Application is designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

vi. Unsuccessful Applicants

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

B. Administrative and National Policy Requirements

i. Registration Requirements

There are several one-time actions before submitting an application in response to this FOA, and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

1. **EERE Funding Opportunity Exchange (eXCHANGE)**
   Register and create an account on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov. This account will allow the user to apply to any open EERE FOAs that are currently in EERE eXCHANGE.

Beginning on July 29, 2022*, eXCHANGE will be updated to integrate with Login.gov. As of September 30, 2022*, potential applicants will be required to have a Login.gov account to access EERE eXCHANGE. As part of the eXCHANGE registration process, new users will be directed to create an account in Login.gov. Please note that the email address associated with Login.gov must match the email address associated with the eXCHANGE account. For more information, refer to the eXCHANGE Multi-Factor Authentication (MFA) Quick Guide in the Manuals section of eXCHANGE.

It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary. **This step is required to apply to this FOA.** The eXCHANGE registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA.**

2. **System for Award Management**
   Register with the SAM at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called a Marketing Partner ID Number (MPIN) are important steps in SAM registration. Please update your SAM registration annually.

3. **FedConnect**
   Register in FedConnect at https://www.fedconnect.net. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

4. **Grants.gov**
   Register in Grants.gov (http://www.grants.gov) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers and Full Applications will not be accepted through Grants.gov.

5. **Electronic Authorization of Applications and Award Documents**

* Please note that these dates are tentative and subject to change.

Submission of an application and supplemental information under this FOA through electronic systems used by the DOE, including EERE eXCHANGE and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR Part 200 as amended by 2 CFR Part 910.

iii. Foreign National Access

All applicants selected for an award under this FOA may be required to provide information to DOE in order to satisfy requirements for foreign nationals' access to DOE sites, information, technologies, equipment, programs or personnel. A foreign national is defined as any person who is not a U.S. citizen by birth or naturalization. If a selected applicant (including any of its subrecipients, contractors or vendors) anticipates involving foreign nationals in the performance of its award, the selected applicant may be required to provide DOE with specific information about each foreign national to ensure compliance with the requirements for access approval. National laboratory personnel already cleared for site access may be excluded.

iv. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier subrecipients. Prime recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

v. National Policy Requirements

The National Policy Assurances that are incorporated as a term and condition of award are located at: http://www.nsf.gov/awards/managing/rtc.jsp.

vi. Environmental Review in Accordance with National Environmental Policy Act (NEPA)

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA (42 U.S.C. 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 https://www.energy.gov/nepa.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project. If DOE determines certain records must be prepared to complete the NEPA review process (e.g., biological evaluations or environmental assessments), the recipient may be required to prepare the records and the costs to prepare the necessary records may be included as part of the project costs.

vii. Applicant Representations and Certifications

1. **Lobbying Restrictions**
   By accepting funds under this award, the prime recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. § 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. **Corporate Felony Conviction and Federal Tax Liability Representations**
   In submitting an application in response to this FOA, the applicant represents that:

   a. It is **not** a corporation that has been convicted of a felony criminal violation under any federal law within the preceding 24 months; and

   b. It is **not** a corporation that has any unpaid federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

   For purposes of these representations the following definitions apply:

   A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

3. **Nondisclosure and Confidentiality Agreements Representations**
   In submitting an application in response to this FOA the applicant represents that:

a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a federal department or agency authorized to receive such information.

b. It **does not and will not** use any federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

(1) *''These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling.''*

(2) The limitation above shall not contravene requirements applicable to Standard Form 312 Classified Information Nondisclosure Agreement (https://fas.org/sgp/othergov/sf312.pdf), Form 4414 Sensitive Compartmented Information Disclosure Agreement (https://fas.org/sgp/othergov/intel/sf4414.pdf), or any other form issued by a federal department or agency governing the nondisclosure of classified information.

(3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an

authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

viii. Statement of Federal Stewardship

EERE will exercise normal federal stewardship in overseeing the project activities performed under EERE awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing assistance and/or temporary intervention in unusual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

ix. Statement of Substantial Involvement

EERE has substantial involvement in work performed under awards made as a result of this FOA. EERE does not limit its involvement to the administrative requirements of the award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the recipient for the management, control, direction, and performance of the project.

2. EERE may intervene in the conduct or performance of work under this award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.

3. EERE may redirect or discontinue funding the project based on the outcome of EERE's evaluation of the project at the Go/No-Go decision point(s).

4. EERE participates in major project decision-making processes.

x. Subject Invention Utilization Reporting

In order to ensure that prime recipients and subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE may require that each prime recipient holding title to a subject invention submit annual reports for ten (10) years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by prime recipient or their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the prime recipient, and such other data and information as EERE may specify.

xi. Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards.

xii. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement.

xiii. Go/No-Go Review

Each project selected under this FOA will be subject to a periodic project evaluation referred to as a Go/No-Go Review. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the EERE program goals and objectives. Federal funding beyond the Go/No-Go decision point (continuation funding) is contingent upon (1) availability of federal funds appropriated by Congress for the purpose of this program; (2) the availability of future-year budget authority; (3) recipient's technical progress compared to the Milestone Summary Table stated in Attachment 1 of the award; (4) recipient's submittal of required reports; (5) recipient's compliance with the terms and conditions of the award; (6) EERE's Go/No-Go decision; (7) the recipient's submission of a continuation application; and (8) written approval of the continuation application by the Contracting Officer.

As a result of the Go/No-Go Review, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

The Go/No-Go decision is distinct from a non-compliance determination. In the event a recipient fails to comply with the requirements of an award, EERE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

xiv. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative

agreement was awarded that would defray the cost to the United States government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States government would otherwise exceed $20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xv. Uniform Commercial Code (UCC) Financing Statements

Per 2 CFR 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with federal funds, and when the federal share of the financial assistance agreement is more than $1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of $5,000 purchased with project funds. These financing statement(s) must be approved in writing by the Contracting Officer prior to the recording, and they shall provide notice that the recipient's title to all equipment (not real property) purchased with federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the government retains an undivided reversionary interest in the equipment. The UCC financing statement(s) must be filed before the Contracting Officer may reimburse the recipient for the federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the Contracting Officer may direct.

xvi. Implementation of Executive Order 13798, Promoting Free Speech and Religious Liberty

States, local governments, or other public entities may not condition sub-awards in a manner that would discriminate, or disadvantage sub-recipients based on their religious character.

xvii. Participants and Collaborating Organizations

If selected for award negotiations, the selected applicant must submit a list of personnel who are proposed to work on the project, both at the recipient and subrecipient level and a list of collaborating organizations within 30 days after the applicant is notified of the selection. Recipients will have an ongoing

responsibility to notify DOE of changes to the personnel and collaborating organizations, and submit updated information during the life of the award.

xviii. Current and Pending Support

If selected for award negotiations, within 30 days of the selection notice, the selectee must submit 1) current and pending support disclosures and resumes for any new PIs or senior/key personnel and 2) updated disclosures if there have been any changes to the current and pending support submitted with the application. Throughout the life of the award, the Recipient has an ongoing responsibility to submit 1) current and pending support disclosure statements and resumes for any new PI and senior/key personnel and 2) updated disclosures if there are changes to the current and pending support previously submitted to DOE. Also See. Section IV.E.xvii.

xix. U.S. Manufacturing Commitments

A primary objective of DOE's multi-billion dollar research, development and demonstration investments is to cultivate new research and development ecosystems, manufacturing capabilities, and supply chains for and by U.S. industry and labor. Therefore, in exchange for receiving taxpayer dollars to support an applicant's project, the applicant must agree to the following U.S. Competitiveness Provision as part of an award under this FOA.

U.S. Competitiveness

The Recipient agrees that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States unless the Recipient can show to the satisfaction of DOE that it is not commercially feasible. In the event DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., alternative binding commitments to provide an overall net benefit to the U.S. economy. The Recipient agrees that it will not license, assign or otherwise transfer any subject invention to any entity, at any tier, unless that entity agrees to these same requirements. Should the Recipient or other such entity receiving rights in the invention(s): (1) undergo a change in ownership amounting to a controlling interest, or (2) sell, assign, or otherwise transfer title or exclusive rights in the invention(s), then the assignment, license, or other transfer of rights in the subject invention(s) is/are suspended until approved in writing by DOE. The Recipient and any successor assignee will convey to DOE, upon written request from DOE, title to any subject

invention, upon a breach of this paragraph. The Recipient will include this paragraph in all subawards/contracts, regardless of tier, for experimental, developmental or research work.

A subject invention is any invention conceived or first actually reduced in performance of work under an award. An invention is any invention or discovery which is or may be patentable.

As noted in the U.S. Competitiveness Provision, at any time in which an entity cannot meet the requirements of the U.S. Competitiveness Provision, the entity may request a modification or waiver of the U.S. Competitiveness Provision. For example, the entity may propose modifying the language of the U.S. Competitiveness Provision in order to change the scope of the requirements or to provide more specifics on the application of the requirements for a particular technology. As another example, the entity may request that the U.S. Competitiveness Provision be waived in lieu of a net benefits statement or U.S. manufacturing plan. The statement or plan would contain specific and enforceable commitments that would be beneficial to the U.S. economy and competitiveness. Commitments could include manufacturing specific products in the U.S., making a specific investment in a new or existing U.S. manufacturing facility, keeping certain activities based in the U.S. or supporting a certain number of jobs in the U.S. related to the technology. If DOE, in its sole discretion, determines that the proposed modification or waiver promotes commercialization and provides substantial U.S. economic benefits, DOE may grant the request and, if granted, modify the award terms and conditions for the requesting entity accordingly.

The U.S. Competitiveness Provision is implemented by DOE pursuant to a Determination of Exceptional Circumstances (DEC) under the Bayh-Dole Act and DOE Patent Waivers. See Section VIII.J. Title to Subject Inventions of this FOA for more information on the DEC and DOE Patent Waivers.

xx. Data Management Plan (DMP)

Each applicant whose Full Application is selected for award negotiations will be required to submit a DMP during the award negotiations phase. A DMP explains how, when appropriate, data generated in the course of the work performed under an EERE award will be shared and preserved in order to validate the results of the proposed work or how the results could be validated if the data is not shared or preserved. The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publications.

VII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: systemsinnovation@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on EERE eXCHANGE at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA**. EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE eXCHANGE website should be submitted to: EERE-eXCHANGESupport@hq.doe.gov.

VIII. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the EERE eXCHANGE website and the Grants.gov system. However, you will only receive an email when an amendment or a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. Government Right to Reject or Negotiate

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. Commitment of Public Funds

The Contracting Officer is the only individual who can make awards or commit the government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

D. Treatment of Application Information

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is

necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA. Applicants are advised to not include any critically sensitive proprietary detail.

If an application 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, EERE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for merit 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.

Full Applications, and other 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 cover sheet of the Full Application, and other 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 or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [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 or highlighting.

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/No-Go Reviews and Peer Reviews, the government may seek the advice of qualified non-federal personnel as reviewers. The government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities, including EERE contractors. The applicant, by submitting its application, consents to the use of non-federal reviewers/administrators. Non-federal reviewers must sign conflict of interest (COI) and non-disclosure acknowledgements (NDA) prior to reviewing an application. Non-federal personnel conducting administrative activities must sign an NDA.

F. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this FOA include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

G. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

H. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

I. Retention of Submissions

EERE expects to retain copies of all Full Applications and other submissions. No submissions will be returned. By applying to EERE for funding, applicants consent to EERE's retention of their submissions.

J. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below:

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;
- All other parties: The federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below);
- Class Patent Waiver:

DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States.

- Advance and Identified Waivers: For an applicant not covered by a Class Patent Waiver or the Bayh-Dole Act, the applicant may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.

- DEC: On June 07, 2021, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES (DEC) UNDER THE BAYH-DOLE ACT TO FURTHER PROMOTE DOMESTIC MANUFACTURE OF DOE SCIENCE AND ENERGY TECHNOLOGIES. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with Section VI.B.xx. U.S. Manufacturing Committments of this FOA. A copy of the DEC can be found at https://www.energy.gov/gc/determination-exceptional-circumstances-decs. Pursuant to 37 CFR § 401.4, any nonprofit organization or small business firm as defined by 35 U.S.C. 201 affected by any DEC has the right to appeal it by providing written notice to DOE within 30 working days from the time it receives a copy of the determination.

K. Government Rights in Subject Inventions

Where prime recipients and subrecipients retain title to subject inventions, the U.S. government retains certain rights.

i. Government Use License

The U.S. government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the government.

ii. March-In Rights

The U.S. government retains march-in rights with respect to all subject inventions. Through "march-in rights," the government may require a prime recipient or subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the government may grant licenses for use of the subject invention when a prime recipient, subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by federal statutes in a reasonably satisfied manner; or
- The U.S. manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

L. Rights in Technical Data

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

"Limited Rights Data": The U.S. government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense

prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government Rights in Technical Data Produced Under Awards: The U.S. government normally retains unlimited rights in technical data produced under government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated ("Protected Data"). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

M. Copyright

The prime recipient and subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without EERE approval. When copyright is asserted, the government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the government.

N. Export Control

The U.S. government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the U.S. to protect national security, foreign policy, and economic interests without imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as "Export Controls". To ensure compliance with Export Controls, it is the prime recipient's responsibility to determine when its project activities trigger Export Controls and to ensure compliance.

Export Controls may apply to individual projects, depending on the nature of the tasks. When Export Controls apply, the recipient must take the appropriate steps to obtain any required governmental licenses, monitor and control access to restricted information, and safeguard all controlled materials. Under no circumstances may foreign entities (organizations, companies or persons) receive access to export controlled information unless proper export procedures have been satisfied and such access is authorized pursuant to law or regulation.

O. Personally Identifiable Information (PII)

All information provided by the applicant must to the greatest extent possible exclude PII. The term "PII" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name. (See OMB Memorandum M-17-12 dated January 3, 2017)

By way of example, applicants must screen resumes to ensure that they do not contain PII such as personal addresses, personal landline/cell phone numbers, and personal emails. **Under no circumstances should Social Security Numbers (SSNs) be included in the application**. Federal agencies are prohibited from the collecting, using, and displaying unnecessary SSNs. (See, the Federal Information Security Modernization Act of 2014 (Pub. L. No. 113-283, Dec 18, 2014; 44 U.S.C. § 3551).

P. Annual Independent Audits

If a for-profit entity is a prime recipient and has expended $750,000 or more of DOE awards during the entity's fiscal year, an annual compliance audit performed by an independent auditor is required. For additional information, please refer to 2 CFR 910.501 and Subpart F.

If an educational institution, non-profit organization, or state/local government is a prime recipient or subrecipient and has expended $750,000 or more of federal awards during the non-federal entity's fiscal year, then a Single or Program-Specific Audit is required. For additional information, please refer to 2 CFR 200.501 and Subpart F.

Applicants and subrecipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

Q. Informational Webinar

EERE will conduct one informational webinar during the FOA process. It will be held after the initial FOA release but before the due date for Concept Papers.

Attendance is not mandatory and will not positively or negatively impact the overall review of any applicant submissions. As the webinar will be open to all applicants who wish to participate, applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term "cost sharing," as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here "cost matching" for the non-federal share is calculated as a percentage of the federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. FFRDC costs must be included in Total Project Costs. The following is an example of how to calculate cost sharing amounts for a project with $1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share ($) divided by federal share (%) = Total Project Cost
  Example: $1,000,000 divided by 80% = $1,250,000

- Formula: Total Project Cost ($) minus federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000

- Formula: Non-federal share ($) divided by Total Project Cost ($) = Non-federal share (%)
  Example: $250,000 divided by $1,250,000 = 20%

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the federal government under another award unless authorized by federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

- FAR Part 31 for For-Profit entities, (48 CFR Part 31); and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

General Cost Sharing Rules on a DOE Award

1. Cash Cost Share – encompasses all contributions to the project made by the recipient or subrecipient(s), for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project.

2. In-Kind Cost Share – encompasses all contributions to the project made by the recipient or subrecipient(s) that do not involve a payment or reimbursement and represent donated items or services. In-Kind cost share items include volunteer personnel hours, donated existing equipment, donated existing supplies. The cash value and calculations thereof for all In-Kind cost share items must be justified and explained in the Cost Share section of the project Budget Justification. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out the In-Kind cost share section of the Budget Justification.

3. Funds from other federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC subrecipients. Non-federal sources include any source not originally derived from federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.

4. Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

DOE Financial Assistance Rules 2 CFR Part 200 as amended by 2 CFR Part 910

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the prime recipient's cost sharing if such contributions meet all of the following criteria:

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the FAR, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations; and

b. Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.

(5) They are not paid by the federal government under another award unless authorized by federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item

will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or

b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.

ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

APPENDIX B – WAIVER REQUESTS AND APPROVAL PROCESSES: 1. FOREIGN ENTITY PARTICIPATION AS THE PRIME RECIPIENT; AND 2. PERFORMANCE OF WORK IN THE UNITED STATES (FOREIGN WORK WAIVER)

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a state or territory of the United States and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Overall, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. A request to waive the *Foreign Entity Participation as the prime recipient* requirement must include the following:

- Entity name;
- The rationale for proposing a foreign entity to serve as the prime recipient;
- Country of incorporation and the extent, if any, the entity is state owned or controlled;
- A description of the project's anticipated contributions to the US economy;
- How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the project will promote domestic American manufacturing of products and/or services;
- A description of how the foreign entity's participation as the prime recipient is essential to the project;
- A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
- Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for waiver of the Performance of Work in the United States requirement).

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

2. Waiver for Performance of Work in the United States (Foreign Work Waiver)

As set forth in Section IV.K.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. ("foreign work");
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
- The associated benefits to be realized and the contribution to the project from the foreign work;
- How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

APPENDIX C – GLOSSARY

Applicant – The lead organization submitting an application under the FOA.

Continuation application – A non-competitive application for an additional budget period within a previously approved project period. At least ninety (90) days before the end of each budget period, the Recipient must submit to EERE its continuation application, which includes the following information:

i. A report on the Recipient's progress towards meeting the objectives of the project, including any significant findings, conclusions, or developments, and an estimate of any unobligated balances remaining at the end of the budget period. If the remaining unobligated balance is estimated to exceed 20 percent of the funds available for the budget period, explain why the excess funds have not been obligated and how they will be used in the next budget period.

ii. A detailed budget and supporting justification if there are changes to the negotiated budget, or a budget for the upcoming budget period was not approved at the time of award.

iii. A description of any planned changes from the negotiated Statement of Project Objectives and/or Milestone Summary Table.

Cooperative Research and Development Agreement (CRADA) – a contractual agreement between a national laboratory contractor and a private company or university to work together on research and development. For more information, see https://www.energy.gov/gc/downloads/doe-cooperative-research-and-development-agreements

Federally Funded Research and Development Centers (FFRDC) - FFRDCs are public-private partnerships which conduct research for the United States government. A listing of FFRDCs can be found at http://www.nsf.gov/statistics/ffrdclist/.

Go/No-Go Decision Points: – A decision point at the end of a budget period that defines the overall objectives, milestones and deliverables to be achieved by the recipient in that budget period. As of a result of EERE's review, EERE may take one of the following actions: 1) authorize federal funding for the next budget period; 2) recommend redirection of work; 3) discontinue providing federal funding beyond the current budget period; or 4) place a hold on federal funding pending further supporting data.

Project – The entire scope of the cooperative agreement which is contained in the recipient's Statement of Project Objectives.

Recipient or "Prime Recipient" – A non-federal entity that receives a federal award directly from a federal awarding agency to carry out an activity under a federal program. The term recipient does not include subrecipients.

Subrecipient – A non-federal entity that receives a subaward from a pass-through entity to carry out part of a federal program; but does not include an individual that is a beneficiary of such program. A subrecipient may also be a recipient of other federal awards directly from a federal awarding agency. Also, a DOE/NNSA and non-DOE/NNSA FFRDC may be proposed as a subrecipient on another entity's application. See section III.E.ii.

APPENDIX D – DEFINITION OF TECHNOLOGY READINESS LEVELS

TRL indicates the stage of development/deployment that technologies, which are undergoing partial or full-scale device testing, are currently in.

TRL 1-3: Discovery / Concept Definition / Early Stage Development, Design, and Engineering

The purpose of this stage is to evaluate, to the largest extent possible, the scientific or technical merit and feasibility of ideas that appear to have commercial potential.

- **TRL 1/2**: Scientific research begins to be translated into applied research and development where basic principles are observed and reported. Technology concepts and applications are formulated and investigated through analytic studies and in-depth investigations of principal design considerations. This level is characterized by paper studies, concept exploration, and planning.
- **TRL 3:** At this level, active research is initiated, including engineering studies and laboratory studies to physically validate analytical predictions of separate elements of the technology.

TRL 4: Proof of Concept

The purpose of this stage is to evaluate, insofar as possible, the scientific or technical merit and feasibility of ideas that appear to have commercial potential.

- **TRL 4**: This TRL represents early stage proof-of-concept system or component development, testing, and concept validation. In this stage, critical technology elements are developed and tested in a laboratory environment. It is envisioned that scale models will be at a 1:10 scale or smaller. At this level, basic technological components of a subscale model are integrated to validate design predictions and system-level functionality. The models, or critical subsystems, are tested in a laboratory environment.

TRL 5/6: System Integration and Technology Laboratory Demonstration

At this TRL, device-, system-, and subsystem-level interfacing/integration testing represent a vital stage in technology development, and must be demonstrated. Models should be at a relevant scale (1:1–1:5) to reflect the challenges and realities of the full-scale (1:1) system. Model testing is to be performed at a test facility capable of producing simulated waves/currents and other operational conditions while monitoring device response and performance. Furthermore, the device's foundation concept shall be incorporated and demonstrated.

- **TRL 5**: At this level, basic technological components are fabricated at a scale relevant to full-scale and integrated to establish and verify subsystem and system-level functionality and preparation for testing in a simulated environment.
- **TRL 6:** At this level, a representative model or prototype system at a scale relevant to full-scale, which is beyond that of TRL 5, is tested in a relevant environment. This level represents a major step up in a technology's demonstrated readiness and risk mitigation leading to open water testing.

TRL 7/8: Open Water System Testing, Demonstration, and Operation

At this stage, the device model scale is expected to be at or near full scale (1:1–1:2). Initially, testing may be performed in water at a relatively benign location, with the expectation that testing will then be performed in a fully exposed, open water environment where representative operating environments can be experienced.

The final foundation/mooring design shall be incorporated into model testing at this stage.

- **TRL 7**: At this level, the prototype scale components and subsystems are fabricated and integrated to establish and verify subsystem and system level functionality and preparation for testing in an open water operational environment to verify expected operation and fine tune the design prior to deployment in an operational demonstration project.
- **TRL 8:** At this level, the prototype in its final form (at or near full scale) is to be tested and qualified in an open water environment under all expected operating conditions to demonstrate readiness for commercial deployment in a demonstration project. Testing should include extreme conditions.

TRL 9: Commercial-Scale Production / Application

This stage represents an in-service application of the technology in its final form and under mission condition.

- **TRL 9**: At this level, the actual, commercial-scale system is proven through successful mission operations, whereby it is fielded and being used in commercial application.

APPENDIX E – LIST OF ACRONYMS

BP	Budget Period
CDR	Critical Design Review
CEC	Current Energy Converter
CFD	Computational Fluid Dynamics
COI	Conflict of Interest
COTS	Commercial Off the Shelf
DEC	Determination of Exceptional Circumstances
DEI	Diversity, Equity, and Inclusion
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
EERE	Energy Efficiency and Renewable Energy
FAR	Federal Acquisition Regulation
FEA	Finite Element Analysis
FFATA	Federal Funding and Transparency Act of 2006
FMEA	Failure Modes and Effects Analysis
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FFRDC	Federally Funded Research and Development Center
GAAP	Generally Accepted Accounting Principles
GW	Gigawatt
HERO	Hydraulic and Electric Reverse Osmosis
IEC TC	International Electrochemical Commission Technical Committee
IEEE	Institute of Electrical and Electronics Engineers
IOM&D	Installation, Operations, Maintenance, and Decommissioning
IPMP	Intellectual Property Management Plan
ISO	Iternational Standards Organization
LCOE	Levelized Cost of Energy
LCOW	Levelized Cost of Water
LPM	Liters Per Minute
M&O	Management and Operating
MPIN	Marketing Partner ID Number
MRE	Marine Renewable Energy
MSI	Minority-Serving institution
MSP	Marine Spatial Planning
MYPP	Multi-Year Program Plan
NATO	North Atlantic Treaty Organization
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Agency
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget

OSTI	Office of Scientific and Technical Information
PBE	Powering the Blue Economy
PII	Personal Identifiable Information
PTO	Power Takeoff
QA/QC	Quality Assurance/Quality Control
RO	Reverse Osmosis
R&D	Research and Development
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
STEM	Science, Technology, Engineering, and Mathematics
TDS	Total Dissolved Solids
TIA	Technology Investment Agreement
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
UEI	Unique Entity Identifier
W2W	Waves to Water
WBS	Work Breakdown Structure
WEC	Wave Energy Converter
WP	Work Proposal

APPENDIX F - GENERAL MEASUREMENT LIST FOR OPEN WATER DEPLOYMENT PROJECTS

This appendix presents data that may be required by WPTO to be submitted to MHK-DR as project deliverables. This list is not comprehensive, and WPTO may require data that is not listed in this Appendix to be submitted as deliverables.

Device Specifications

- Description of energy capture technology, including cut-off levels, depth below surface (or above the seabed) of the energy capture axis
- Description of power take-off system and its rating – power, voltage, type of generator, etc.
- Normal range of operating parameters
- Extreme event operating parameters
- Standard dimensions
- Device weight and displacement (ballasted and unballasted)
- Center of mass, center of balance
- Power production
    - Electrical - Rated power output,
    - Average power output (averaged over 1 year)
    - Hydraulic
    - Mechanical
- Capture efficiency
- Availability
- Structural Design
    - CAD drawings of the device
    - List of components and weights
    - Materials used
- Platform/Mooring Design
    - Surface structure geometry
    - Anchor type and weight
    - CAD drawing of anchors
    - Arrangement
    - Mooring line, type, arrangement (slack and taught), thickness and weight
- Power Conversion Chain
    - Power Conversion Chain (PCC) schematic with detailed layout/sizing
    - Breakdown of power conversion components and specs (pistons, generator, accumulators, etc.), including sizing, weight, efficiencies, power, voltage, as applicable
    - Description of control system (ex; latching, frequency of device parameter adjustment, wave by wave, etc.)
    - Control flow diagram including control algorithm(s)
    - Failure rate distribution of each component (by cycles or time)
    - Scheduled Maintenance requirements (i.e. Gearbox needs oil replacement every 2-years)

- Electrical System
  - Electrical topology
  - Subsystems/components: size, weight
  - EMF output (device and cables)
- Biofouling Effects
  - On power output
  - On system loading

Device Measurements

- Motion
- Geodetic position (GPS)
- Heading
- Altitude above bottom
- Waterline
- 6 Degrees of Freedom - surge, sway, heave, roll, pitch, yaw and derivatives
- Power Conversion Chain
- Relative velocity (linear or rotational) that's driving the PTO (for a hydraulic system an equivalent would be piston displacement vs. time)
- Stroke length if applicable
- Generator input torque vs. time
- Power vs. time
- Available power
- Mechanical power
- Generated power
- Internal and generator temperatures
- Cycles
- Vibration/acceleration
- Shaft strain
- Primary structure
- Linear vibration/acceleration
- Loads (strain at primary components > 20 gauges)
- Wave pressure force
- Mooring
- Line tension
- Line angle
- Power (power quality, min sampling rate of 50 kHz (1 minute avg))
- Device voltage
- Device current
- Grid voltage - if applicable
- Grid current - if applicable
- System Health

- Water intrusion
- Internal humidity
- Internal temperature
- Fault status
- Acoustic
- Internal sound levels
- Video
- Surface video
- Subsurface video

Manufacturing

- List components that are one-off constructions versus commercial off-the-shelf (COTS)
- Weights and dimensions associated with the following components:
    - Moorings
    - Float structure
    - Major PTO components such as the generator and hydraulic systems
    - Energy coupling system
    - Power transmission equipment
    - Subsea cable
    - Energy storage system
- List of components that must be assembled on site
- Number of devices planned for an array
    - Description of array configuration
- The supplier(s) of the materials and components
- The lot size ordered, the assemblers/fabricators
- Cost information for the parts
- Where the equipment and materials come from (are they imported?)
- Method and cost of transport

Installation and Operations and Maintenance

- Final assembly procedure at port (cranes, cost, etc.)
- Installation procedure, schedule and cost
- Required dedicated O&M Vessel(s)
- Required onshore O&M facilities
- O&M equipment purchases and cost

Grid Connection

- Overview map showing: (1) deployment location, (2) grid interconnection point, (3) distances
- Cable design details - dimensions, rated capacity, frequency, # of conductors, etc.
- Device or array connection to power transmission cable
- Packing density (Array layouts for: 1, 10, 100 devices)
- Voltage frequency and the permitted tolerances
- Prevailing grid conditions that may have limited the power output during the test period

- Grid connection voltage, current, frequency including measures of voltage flicker and fluctuations, harmonic distortion (including existing grid harmonics and harmonic emission from device), power factor, and voltage unbalance.

Metocean Measurements

- Sea surface
  - Wave time histories (near device)
  - Joint probability distribution
  - Scatter diagram (Hs vs. Te)
  - Directional wave spectra
  - Water depth
- In-Flow
  - Current velocity profile
- Water Properties
  - Temperature (profile with depth if applicable)
  - Salinity
  - pH
  - Conductivity
  - Dissolved oxygen
  - Suspended sediment (concentration, particle size)
  - Turbidity
  - Dissolved nutrients (nitrate, phosphate, silicate, etc.)
- Meteorology
  - Wind speed and direction
  - Air temperature
  - Relative humidity
  - Barometric pressure
- Acoustic
  - Ambient noise/sound levels
- Electromagnetic Field (EMF)
  - Strength
  - Spectra

Bathymetry

- Bathymetry & topology of seabed (could have potential effect on performance of devices/mooring system, quality of tidal currents). Specify measurement method (i.e., multi-beam and/or single-beam , side scan, video, etc.)
- Sub-bottom/sediment core samples with soil characteristics (geotechnical data for designing foundations and anchoring systems)
  - Bulk Density with depth
  - Particle size distribution with depth
  - Total organic carbon (to help characterize benthic habitat)

Biological Characteristics and Effects

- All baseline pre-installation biological survey data
- All biological monitoring for effects during construction, operation and decommissioning

- Baseline assessments of marine animals in area, particularly threatened or endangered species (i.e. marine mammals, seabirds, resident and migratory fish, commercially important invertebrates like crab)
- Monitoring data (post installation) of direct and indirect interactions of marine animals with devices
- Benthic substrate characteristics, before and after installation
- Measures of productivity of systems, such as chlorophyll
- Animals affected by acoustics (noise)
- Animals affected by EMF from devices or cables
- Near shore habitat that will be affected by cable crossings, grid connection
- Benthic habitat surveys before and after deployment
- Surveys of macrofauna before and after deployment
- Remote operated vehicle (ROV) survey results
- Type of monitoring equipment & methodology

Siting and Acceptance

- Fishing - Commercial/recreational/subsistence
- Key recreational uses
- Navigation, commercial shipping, etc.
- Outreach activities
- Demographic studies
- Other marine industries
- Nearby port/landing facility
- Outline of required studies
- Study cost estimates
- Permitting process cost and timelines

Desalination

- Water Production in volume or flow rates
- Water quality parameters (dependent on end-use)
    - Total Dissolve Solids (TDS)
    - pH
    - temperature
    - Boron
    - E.coli / Heterotrophic Plate Count (HPC)
    - Metals (specify applicable tests)
    - Coliforms
    - Color
    - Odor and taste
- Reverse osmosis (RO) system
    - Membrane performance

- Pre-treatment and post-treatment
- Pressure
- Brine discharge / diffusion
- (production and discharge rates)

APPENDIX G – DOE MARINE ENERGY DATA REPOSITORY PLAN

All data collected, as well as key deliverables, should be delivered in accordance with the Federal Assistance Reporting Checklist. Data will be uploaded either to the EERE Project Management Center (PMC), DOE CODE, Interagency Edison (iEdison), USDOE Scientific and Technical Information management system (OSTI elink), to the relevant WPTO-funded PRIMRE Knowledge Hubs (MHKDR, Tethys, Tethys Engineering, and MRE Software). Data should be uploaded as it is generated, but no later than the end of each reporting quarter in which the data is generated. The data will be made publicly available once it has been submitted, curated, and accepted into the appropriate system. Data submitted to MHKDR that have been identified as protected, or subject to a moratorium, will not be made publicly available until the period of protection is over or the moratorium has expired, and will be held in a secure section of the system. Protected Data will be treated according to the Intellectual Property Provisions of the Award.

Products resulting from WPTO financial assistance should be uploaded to the appropriate PRIMRE Knowledge Hub:

- MHKDR
    - Data; including any modeling outputs, visualizations, schematics, videos, code, software, raw data or other digital assets suitable for public release should be uploaded to DOE Marine and Hydrokinetic Data Repository (https://mhkdr.openei.org). For more information, see the MHK Data Repository Training Video online at https://youtube.com/openei or access tutorials and frequently asked questions (FAQs) under "Help" at https://mhkdr.openei.org.
- Tethys
    - Publications (such as journal articles, technical reports, conference papers, white papers, or as well as other public documents) focused on research, monitoring results, or technology development to assess and mitigate environmental effects of marine energy will be contributed to Tethys. (https://tethys.pnnl.gov/contributing-tethys). All uploads are carried out by the Tethys team at PNNL.
- Tethys Engineering
    - Publications (such as journal articles, technical reports, conference papers, white papers, or as well as other public documents) focused on technical and engineering information about marine energy will be contributed to Tethys Engineering (https://tethys-engineering.pnnl.gov/contribute-tethys-engineering). All uploads are carried out by the Tethys Engineering team at PNNL.
- MRE Software

Software developed for marine energy applications should be hosted on the PRIMRE Code Catalog (https://openei.org/wiki/PRIMRE/Code_Catalog). Submit software through the MRE

Code Submission Form. Open-source software hosted on a public repository will automatically be forked into the GitHub MRE Code Hub (https://github.com/MRE-Code-Hub).

APPENDIX H – INTERNATIONAL STANDARDS INFORMATION

The following table provides information on the international standards that projects funded under this FOA should consider, as appropriate. This appendix does not provide a comprehensive list of relevant standards and applicants are responsible for identifying the standards appropriate to consider for their project. More information on International Electrotechnical Commission Standards (IEC) – Technical Committee (TC) 114 - Marine energy - Wave, tidal and other water current converters is available on the IEC TC 114 website[1]

Document	Title	Reference	Scope
IEC TS 62600-2	Marine energy systems - Design requirements	https://webstore.iec.ch/publication/62399	Provides design requirements to ensure the engineering integrity of wave, ocean, tidal and river current energy converters, collectively referred to as marine energy converters. Its purpose is to provide an appropriate level of protection against damage from all hazards that may lead to catastrophic failure of the MEC structural, mechanical, electrical or control systems.
62600-3	Measurement of mechanical loads	https://webstore.iec.ch/publication/60359	Describes the measurement of mechanical loads on hydrodynamic marine energy converters such as wave, tidal and other water current converters (including river current converters) for the purpose of load simulation model validation and certification. This document contains the requirements and recommendations for the measurement of mechanical loads for such activities as site selection, measurand selection, data acquisition, calibration, data verification, measurement load cases, capture matrix, post-processing, uncertainty determination and reporting.
62600-4	Specification for establishing qualification of new technology	https://webstore.iec.ch/publication/63710	Specifies the requirements of the technology qualification process for marine renewable technologies. Technology Qualification is a process of providing evidence and arguments to support claims that the technology under assessment will function reliably in a target operating environment within specific limits and with an acceptable level of confidence.
62600-10	Assessment of mooring system for marine energy converters	https://webstore.iec.ch/publication/22012	Provides uniform methodologies for the design and assessment of mooring systems for floating MECs. It is intended to be applied at various stages, from mooring system assessment to design, installation and maintenance of floating MEC plants. Is applicable to mooring systems for floating MEC units of any size or type in any open water conditions. The intent of this technical specification is to highlight the different requirements of MECs.

62600-30	Electrical power quality requirements	https://webstore.iec.ch/publication/28781	Includes: definition and specification of the quantities to be determined for characterizing the power quality of a marine energy (wave, tidal and other water current) converter unit; measurement procedures for quantifying the characteristics of a marine energy (wave, tidal and other water current) converter. The measurement procedures are valid for a single marine energy converter (MEC) unit (or farm) with three-phase grid or an off-grid connection. The measurement procedures are valid for any size of MEC unit.
62600-40	Acoustic characterization of marine energy converters	https://webstore.iec.ch/publication/31031	Provides uniform methodologies to consistently characterize the sound produced by the operation of marine energy converters that generate electricity, including wave, current, and ocean thermal energy conversion. This document does not include the characterization of sound associated with installation, maintenance, or decommissioning of these converters, nor does it establish thresholds for determining environmental impacts. Characterization refers to received levels of sound at particular ranges, depths, and orientations to a marine energy converter.
62600-100	Electricity producing wave energy converters - Power performance assessment	https://webstore.iec.ch/publication/60192	Provides a method for assessing the electrical power production performance of a Wave Energy Converter (WEC), based on the performance at a testing site. Provides a systematic method which includes: - measurement of WEC power output in a range of sea states; - WEC power matrix development; - an agreed framework for reporting the results of power and wave measurements. The contents of the corrigendum of April 2017 have been included in this copy.
62600-101	Wave energy resource assessment and characterization	https://webstore.iec.ch/publication/22593	Establishes a system for estimating, analyzing and reporting the wave energy resource at sites potentially suitable for the installation of Wave Energy Converters (WECs). This Technical Specification is to be applied at all stages of site assessment from initial investigations to detailed project design. In conjunction with IEC TS 62600-100 (WEC performance) it enables an estimate of the annual energy production of a WEC or WEC array to be calculated.
62600-102	Wave energy converter power	https://webstore.iec.ch/publication/25626	Describes the required methods and the required conditions to determine the power performance of the Wave Energy Converter 2 (WEC 2) in Location 2, possibly at a different scale and with configuration changes to

	performance assessment at a second location using measured assessment data		accommodate the new site conditions, in all cases based on measured power performance of WEC 1 in Location 1. This technical specification allows for assessment at Location 1 or Location 2 based on limited/incomplete data material, as long as this is accompanied by a validated numerical model or physical model and assessment of the uncertainty involved. Another key element is transparency in the assessment.
62600-103	Guidelines for the early stage development of wave energy converters - Best practices and recommended procedures for the testing of pre-prototype devices	https://webstore.iec.ch/publication/32966	Is concerned with the sub-prototype scale development of wave energy converters. It includes the wave tank test programmes, where wave conditions are controlled so they can be scheduled, and the first large-scale sea trials, where sea states occur naturally and the programmes are adjusted and flexible to accommodate the conditions. This document describes the minimum test programmes that form the basis of a structured technology development schedule. For each testing campaign, the prerequisites, goals and minimum test plans are specified.
62600-200	Electricity producing tidal energy converters - Power performance assessment	https://webstore.iec.ch/publication/7242	Provides the following items: - a systematic methodology for evaluating the power performance of tidal current energy converters (TECs) that produce electricity for utility scale and localized grids; - a definition of TEC rated power and rated water velocity; - a methodology for the production of the power curves for the TECs in consideration; - a framework for the reporting of results. City rural electrification marine power
IEEE 1547	IEEE Standard for Interconnection and Interoperability of	https://standards.ieee.org/standard/1547-2018.html	The technical specifications for, and testing of, the interconnection and interoperability between utility electric power systems (EPSs) and distributed energy resources (DERs) are the focus of this standard. It provides requirements relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection. It also includes

	Distributed Energy Resources with Associated Electric Power Systems Interfaces		general requirements, response to abnormal conditions, power quality, islanding, and test specifications and requirements for design, production, installation evaluation, commissioning, and periodic tests. The stated requirements are universally needed for interconnection of DER, including synchronous machines, induction machines, or power inverters/converters and will be sufficient for most installations. The criteria and requirements are applicable to all DER technologies interconnected to EPSs at typical primary and/or secondary distribution voltages. Installation of DER on radial primary and secondary distribution systems is the main emphasis of this document, although installation of DERs on primary and secondary network distribution systems is considered. This standard is written considering that the DER is a 60 Hz source.

[1] https://www.iec.ch/dyn/www/f?p=103:7:916162839123::::FSP_ORG_ID:1316

APPENDIX I – MARINE ENERGY DESALINATION RESOURCES

The following resources are provided as additional information for guiding development of technology designs, performance benchmarks and/or metrics, commercialization plans, and other issues associated with marine energy and desalination.

Key Marine Powered Desalination References:

1. Yu, Yi-Hsiang and Dale Jenne. "Numerical Modeling and Dynamic Analysis of a Wave-Powered Reverse-Osmosis System." *Journal of Marine Science and Engineering* 6 (2018): 132. https://www.mdpi.com/2077-1312/6/4/132

   In this study, a wave-to-water numerical model was developed to investigate the potential use of a wave-powered desalination system (WPDS) for water production. The model was developed by coupling a time-domain radiation-and-diffraction method-based numerical tool (WEC-Sim) for predicting the hydrodynamic performance of WECs with a solution-diffusion model that was used to simulate the reverse-osmosis (RO) process.

2. Yu, Yi-Hsiang, and Dale Jenne. 2017. "Analysis of a Wave-Powered, Reverse-Osmosis System and Its Economic Availability in the United States." *36th Annual International Conference on Ocean, Offshore and Arctic Engineering.* Trondheim, Norway. June 25–30. https://www.nrel.gov/docs/fy17osti/67973.pdf

   In this study, a wave-to-water numerical model was developed to investigate the potential use of a wave-powered desalination system (WPDS) for water production in the United States.

3. Nakhai, Aryana, Ben McGilton, and Scott Jenne. 2022. Summary Report of HERO WEC Test Article for Waves to Water: Electrical Power Take-Off. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5700-83621. https://www.nrel.gov/docs/fy22osti/83621.pdf

   The intent of this report is to provide the public with a summary of the electrical subsystem designed for the HERO WEC as well as highlight the technical limitations of fabricating a WEC with a reliable electrical power take-off at this scale.

4. LiVecchi,A., A. Copping, D.Jenne, A. Gorton, R. Preus, G. Gill, R. Robichaud,R. Green, S. Geerlofs, S. Gore, D. Hume, W. McShane, C. Schmaus, H. Spence. Powering the Blue Economy: Exploring Opportunities for Marine Renewable Energy in Maritime Markets: Desalination, Chapter 7. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Washington, D.C. (2019). https://www.energy.gov/sites/prod/files/2019/03/f61/Chapter%207.pdf

This is the key chapter on desalination from WPTO's *Powering the Blue Economy: Exploring Opportunities for Marine Renewable Energy in Martime Markets* published in 2019. This chapters explores the opportunity area for marine energy devices describing technical challenges, high-level requirements, and preliminary market analysis.

5. **Dupont WAVE Model:** https://www.dupont.com/water/resources/design-software.html

WAVE is an integrated expert modeling software for water-treatment plant design, including wastewater-treatment plant design

6. Iana Aranda, Alex Fairhart, Erin Peiffer, Marc Santos, and Sahar Shamsi. NREL Waves to Water Prize Program: Sensitivity Analysis of Alternative Markets. Engineering for Change, Isle Utilities, U.S. Department of Energy, and the National Renewable Energy Laboratory. (2022). https://www.nrel.gov/docs/fy23osti/84229.pdf

Sensitivity Analysis of market alternatives to evaluate commercialization barriers for the Waves to Water (W2W) competitors. This analysis included interviews with organizations and end-users in three market categories: disaster relief; commercial/industrial; and municipal, residential, and government markets. For each category, the project team selected organizations that provided a well rounded experience and set of drivers for adopting W2W technologies. Specific drivers discussed include cost and related drivers, size needs, capabilities for installing and operating systems, and overall reliability needs.

7. Iana Aranda, Alex Fairhart, Erin Peiffer, Marc Santos, and Sahar Shamsi. NREL Waves to Water Prize Program: Capability Matrix. Engineering for Change, Isle Utilities, U.S. Department of Energy, and the National Renewable Energy Laboratory. (2022). https://www.nrel.gov/docs/fy23osti/84224.pdf

Spreadsheet of findings from the W2W Sensitivity Analysis Report (6) that summarizes wave-powered desalination market adoption drivers by the level of barrier each presents to the organizations and end-users interviewed, including representatives from disaster relief; commercial/industrial; and municipal, residential, and government markets.

Water Quality References:

8. Guidelines for drinking-water quality, 2nd ed. Vol. 2. Health criteria and other supporting information. World Health Organization, Geneva, 1996.

9. Requirements for Water Potability During Field Operations and in Emergency Situations. NATO Standard. Edition A Version 1 MARCH 2013 http://www.coemed.org/files/stanags/03_AMEDP/AMedP-4.9_EDA_V1_E_2136.pdf

This publication establishes the requirements for water potability during all field operations and in emergency situations and is a useful reference for systems focused on disaster relief and emergency response.

Department of Energy Publications on the Energy Water Nexus:

10. Bandwidth Study on Energy Use and Potential Energy Savings Opportunities in U.S. Seawater Desalination Systems. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Washington, D.C. (2017). https://www.energy.gov/sites/prod/files/2017/12/f46/Seawater_desalination_bandwidth_study_2017.pdf#:~:text=The%20U.S.%20Department%20of%20Energy%E2%80%99s%20%28DOE%E2%80%99s%29%20Advanced%20Manufacturing,potential%20energy%20savings%20opportunities%20across%20the%20desalination%20system.

The U.S. Department of Energy's (DOE's) Advanced Manufacturing Office (AMO) has commissioned a bandwidth study to analyze the different unit operations used for seawater desalination for municipal (defined here as systems serving more than 10,000 people) systems providing potable water, and provide hypothetical, technology-based estimates of potential energy savings opportunities across the desalination system.

11. The Water-Energy Nexus: Challenges and Opportunities Overview and Summary. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Washington, D.C. (2014). https://www.energy.gov/sites/default/files/2014/07/f17/Water%20Energy%20Nexus%20Full%20Report%20July%202014.pdf

Report detailing DOE actions and priorities in response to water security and water energy challenges, especially in the technology R&D space. While dated as a strategic document, there are significant data and analyses throughout that are informative.

Other Useful Resources:

12. National Alliance for Water Innovation (NAWI) Master Technology Roadmap

David Sedlak, Meagan Mauter, Jordan Macknick, Jennifer Stokes-Draut, Peter Fiske, Deb Agarwal, Thomas Borch, Richard Breckenridge, Tzahi Cath, Shankar Chellam, Amy Childress, Dion D. Dionysiou, Daniel Giammar, Eric Hoek, Sunny Jiang, Lynn Katz, Jaehong Kim, Robert Kostecki, Jeffrey McCutcheon, Yarom Polsky, Zachary Stoll, Pei Xu. 2021. National Alliance for Water Innovation (NAWI) Master Roadmap. DOE/GO-102021-5617. https://www.nrel.gov/docs/fy21osti/80705.pdf

13. White House Action Plan on Global Water Security

https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-vice-president-harris-announces-action-plan-on-global-water-security-and-highlights-the-administrations-work-to-build-drought-resilience/