The U.S. Department of Energy (DOE) Waves to Water Prize DESIGN STAGE will be governed by this Official Rules document, which establishes the rules and requirements for the Waves to Water Prize. The Prize Administrator and DOE reserve the right to modify this Official Rules document and will publicly post any such notifications as well as notify prize participants.
Table of Contents

Executive Summary ........................................................................................................................................... 5
Technology Development Goals ......................................................................................................................... 5
Prize Stages ....................................................................................................................................................... 6
CLOSED—STAGE I: CONCEPT ......................................................................................................................... 6
STAGE II: DESIGN ............................................................................................................................................ 7
STAGE III: CREATE ........................................................................................................................................... 7
STAGE IV: DRINK ............................................................................................................................................... 8
Applications Not of Interest ................................................................................................................................. 8
Participant Eligibility ......................................................................................................................................... 8
Background ....................................................................................................................................................... 9
Wave Power: An Energy Opportunity ............................................................................................................... 10
Stage I: CONCEPT—Closed ............................................................................................................................... 11
Stage II: DESIGN Rules and Requirements ...................................................................................................... 11
Introduction ....................................................................................................................................................... 11
How to Enter ..................................................................................................................................................... 12
Important Dates ................................................................................................................................................ 13
What to Submit ................................................................................................................................................ 13
Cover Page Content ....................................................................................................................................... 13
Submission Summary Slide ............................................................................................................................... 14
Scored Items: Technical Narrative and Modeling Documentation ................................................................. 14
Modeling Documentation .................................................................................................................................. 19
Minimum System Technical Requirements ....................................................................................................... 20
Reporting Key Findings .................................................................................................................................. 22
Letters of Commitment or Support .................................................................................................................. 24
How We Determine Winners ............................................................................................................................ 24
Additional Terms and Conditions .................................................................................................................... 25
Stage III: CREATE Stage Rules and Requirements .......................................................................................... 26
Overview ......................................................................................................................................................... 26
Prizes ................................................................................................................................................................. 26
Important Dates ............................................................................................................................................... 26
Stage IV: DRINK Stage Rules and Requirements ............................................................................................ 27
Overview ......................................................................................................................................................... 27
Prizes ................................................................................................................................................................. 27
Important Dates ............................................................................................................................................... 27
Appendix 1—Additional Terms and Conditions ................................................................. 29

Requirements .................................................................................................................. 29
Verification for Winner Payments: .................................................................................. 29
Teams and Single Entity Awards ...................................................................................... 30
Submission Rights ......................................................................................................... 30
Copyright .......................................................................................................................... 31
Contest Subject to Applicable Law .................................................................................. 31
Resolution of Disputes .................................................................................................... 31
Publicity ............................................................................................................................. 31
Liability .............................................................................................................................. 31
Submission Marking and FOIA ....................................................................................... 32
Privacy ............................................................................................................................... 32
General Conditions ......................................................................................................... 33
Prize Administrator .......................................................................................................... 33
National Environmental Policy Act (NEPA) Compliance .................................................. 33
Judge Conflict of Interest ............................................................................................... 33

Appendix 2—Additional DRINK Technical Goals Details ............................................. 35

Site Testing Conditions .................................................................................................. 35
Ease of Deployment .......................................................................................................... 35
Set Shipping Container Size ........................................................................................... 35
Water Quality .................................................................................................................... 36
Flexibility of Systems ...................................................................................................... 36
Environmental Benefits and Management ...................................................................... 37
Executive Summary

This is the second stage of this prize, the DESIGN Stage, which offers competitors up to $800,000 in cash prizes. This DESIGN Stage asks competitors to submit a plan and provide detailed modeling of the system.

In June 2019, the U.S. Department of Energy (DOE) Water Power Technologies Office (WPTO) launched a prize to develop wave energy-powered desalination systems. The Waves to Water Prize is a four-stage, $2.5M contest to accelerate the development of small, modular, wave-powered desalination systems capable of providing potable drinking water in disaster relief scenarios and remote coastal locations.

The Prize aims to attract dedicated teams of highly capable individuals and provide them with sufficient incentives so that they will advance their technologies through completion of the prize. While the technology development goals of the prize are specifically tailored to address the unique circumstances around disaster response or remote coastal community water needs, the purpose is also to advance technologies that could have broader applications for wave energy and desalination technologies. Through the competition, participants will develop skills and knowledge that will contribute to a general improvement and proliferation of wave power and desalination technologies.

Technology Development Goals

The purpose of this program is to incentivize the creation of wave-powered desalination systems that meet the following goals:

- **Flexibility in Varied Wave Conditions**: Competitors must develop systems that can survive harsh wave conditions and operate under different wave conditions and different sites without major tuning to ensure operation at a wide variety of locations. All solutions that make it to the DRINK Stage will be evaluated at an open-water test site with an anticipated average- to low-energetic wave resource.

- **Easily Deployed**: Systems must be able to be deployed in less than 48 hours, addressing the ability to deploy quickly and easily in a disaster response scenario where there is large uncertainty around site conditions.

- **Ship in a Standard Container**: Technologies must fit into a predefined container internal dimensions of the container are approximately 41 x 44 x 35 inches—to standardize the shipping constraints that face many disaster response and recovery scenarios.

- **Operate without Environmental Degradation**: Brine discharge, or other salt concentration issues from the process of desalinating water will need to be managed without creating environmental issues.

- **Deliver Minimum Water Quality**: The maximum total dissolved solids (TDS) quantity for this competition is 1,000 mg/L. At the DRINK Stage, competitors will be scored higher if this threshold is exceeded and the water quality is closer to a target goal range of 300–600 TDS mg/L. In addition, it is anticipated in the DRINK stage that higher scores will be awarded to competitors that meet or exceed U.S. Environmental Protection Agency (EPA) drinking water standards.
CLOSED—STAGE I: CONCEPT

90 DAYS: June 13, 2019 to September 11, 2019

Competitors described how their proposed solution meets the goals of the program, as described in Section 1.1 of this document. Submissions detailed the functionality of their wave energy generation technologies, desalination technologies, and their proposed integration methods. This included describing the risks and difficulties of their system, and proposed solutions to their issues. Competitors were evaluated based on the level of innovation of their proposed idea, the feasibility of their system,
the ability to scale-up and other benefits, and their team. On November 14, 2019, DOE announced the 20 winners that received a $10,000 prize.

**STAGE II: DESIGN**

**120 DAYS: November 14, 2019 to March 13, 2020**

Competitors in the DESIGN Stage will develop a technical plan and supporting analysis of their wave-powered desalination system. Submissions have two major components: (1) Modeling Documentation—modeling results to justify supporting claims of performance if a prototype of the system is built; and (2) Technical Narrative—a detailed design of their wave-powered desalination system and a plan to build a prototype of their system, including how major risks will be addressed if the submission wins and the team advances to the CREATE Stage. Teams that demonstrate they have the technical capability and sufficient plans to build a functional or proof-of-concept prototype will be awarded a cash prize. There will be up to 20 winners, who will equally share a total funding amount of $800,000, but not to exceed $100,000 per team even if less than 8 winners are selected. Any eligible entity may compete in the DESIGN Stage regardless of whether they were a competitor in the CONCEPT Stage.

More information on what to submit and the criteria for this stage can be found in Section 4—DESIGN Rules and Requirements.

**STAGE III: CREATE**

**150 DAYS: May 2020 to September 2020 (anticipated)**

Competitors in this stage will have 150 days to build a functional prototype or proof of concept of their system and develop a plan to build and deliver their technology for the DRINK Stage. Between 5 and 10 winners will be awarded equally from a total prize pool of up to $500,000, but not to exceed $150,000 each, even if less than 4 winners are selected. Any eligible entity may compete in the CREATE Stage regardless of whether they were a competitor in the DESIGN or CONCEPT Stage.

The details of Stage III: CREATE are still under development. Detailed rules for this stage will be released before the start of this stage.
STAGE IV: DRINK

180 DAYS: October 2020 to April 2021 (anticipated)

Winners of the CREATE Stage will have up to 180 days to build and ship their systems to a designated test site to conduct a test for up to 5 days. The site will be a testing environment in the ocean. Competitors will compete on efficiency, logistics, and system integration metrics, and will be scored on the ability to meet minimal thresholds, and how they performed against the defined metrics. Only winners of the CREATE Stage can participate in the DRINK Stage.

Multiple winners will be selected, including:

- **Grand Prize:** A grand prize in the amount of $500,000 will be awarded to the competitor with the best overall score.
- **Individual Metrics Prizes:** There will be other prizes awarded to the competitors for a total prize pool of $500,000.

The details of the Stage IV: DRINK are still under development. Detailed rules for this stage will be released before the start of this stage.

Applications Not of Interest

The Prize Administrator must conclude that all of the following statements are true when applied to your submission:

- The proposed solution utilizes wave energy to create drinking water.
- The proposed solution represents an innovation that will move the industry beyond its current state.
- The proposed solution does not target larger desalination systems (e.g., small municipal or community scale).
- The proposed solution does not involve the lobbying of any federal, state, or local government.
- The proposed solution is based on sound fundamental technical principles.

If your proposed solution does not meet the above requirements, it will not be subjected to additional review, will not receive scores from the reviewers, and will not be considered for a prize under the DESIGN Stage of this contest.

Participant Eligibility

The competition is open only to: (a) citizens or permanent residents of the United States; and (b) private or non-federal public entities, such as townships, tribes, corporations, or other organizations that are incorporated in and maintain a primary place of business in the United States. Individuals can compete alone or as a member of a group.
A representative of a private entity can register the entity to compete. So long as an entity is legally formed under the laws of a state or the laws of the United States, individuals working under that entity may participate regardless of immigration status.

DOE employees, employees of sponsoring organizations, members of their immediate families (i.e., spouses, children, siblings, or parents), and persons living in the same household as such persons, whether or not related, are not eligible to participate in this prize. Federal entities and federal employees, acting within the scope of their employment, are also not eligible to participate in any portion of this prize. DOE national laboratory employees cannot participate in any stage of the prize.

Background

From 2017 through early 2019, WPTO conducted analysis and stakeholder engagement to identify and study the range of potential applications and markets for marine energy technologies, beyond a focus on grid-scale power applications. This work resulted in the release of a report in April 2019, entitled *Powering the Blue Economy: Exploring Opportunities for Marine Renewable Energy in Maritime Markets*. The report identifies potential opportunities and challenges for marine energy in eight different ocean markets, including those far out at sea—like ocean observation and mining—and those nearshore, like desalination and coastal resiliency.

The *Powering the Blue Economy* report identifies wave-powered desalination as a potential growth market for marine energy technologies, particularly targeting isolated coastal/island communities with high energy costs. Wave energy-powered desalination systems could help to address coastal challenges such as resilience, disaster recovery, and water scarcity, especially if systems are competitive on price, water production, and reliability when compared to conventional alternatives. However, even given its theoretical advantages, wave-powered desalination is still an early-stage technology with significant market and technical challenges.

Through this prize, WPTO seeks to accelerate innovation in both wave energy devices and desalination systems, and create the incentive for teams to build interdisciplinary approaches to integrate wave power and desalination. WPTO aims to leverage the expertise and creativity of academia, industry, government, and other partners engaged in marine energy and desalination technologies through this prize. Due to its interdisciplinary challenges, the Prize seeks to unite the water technology community, the marine renewable energy industry, and the set of experts and stakeholders working to address water security challenges in remote or island communities. It is WPTO's hope that by supporting competitors to demonstrate initial viability through this contest, it will provide a spark for additional private sector investment.

While the focus of this prize is specific to remote communities and disaster response, WPTO seeks to uncover innovation to advance marine energy technology readiness for cost-competitive applications of both small-scale and municipal-scale water production, or other technological advancements that could advance the state of wave energy for other market applications.

In addition to the work being explored by WPTO, DOE is deeply invested in a variety of technology solutions to solve many challenges related to freshwater, as its availability is a big, multi-faceted challenge. This includes, among other energy-water nexus challenges, the recently announced Water Security Grand Challenge.
Wave Power: An Energy Opportunity

Desalination is an energy-intensive process, where typically energy is used for a variety of purposes, which could include driving fluid through a membrane, providing heat for a distillation or evaporation process, and/or hybrid configurations. The high energy costs (in many cases electricity costs) of these systems have economic implications for their owner/operators, as fuel costs can be variable and leave operators with little predictability of the operational costs to run these systems. Additionally, unlike capital expenditures (i.e., buying the equipment) operational costs cannot be amortized over the life of the project. The ability to bypass these energy costs—either by producing off-grid, decentralized electricity to directly power the system or by eliminating the need for electricity through direct pressurization—could be critical for development, driving significant cost savings and reducing the risk or sensitivity of technologies to dynamic energy prices. Companies and technology developers in the marine energy space believe wave-powered desalination may help address these issues.

The National Renewable Energy Laboratory (NREL) has researched and modeled wave powered concepts that directly pressurize reverse-osmosis (RO) seawater desalination systems. NREL’s simulation results suggest that a wave-pressurized RO application could be more cost competitive when producing water than a wave energy system producing electricity, given current cost estimates.¹ This finding signals a near-term market opportunity for wave energy requiring smaller cost reductions before the technology is commercially competitive with grid-power applications.

The United States has one of the most compelling and varied wave resources across its coastline, where integrating wave energy and seawater desalination could have specific advantages:

- **Wave energy can produce clean water without any electrons.** Many desalination processes, such as RO, traditionally require a reliable grid-connected power supply to provide continuous energy input (e.g., pressure across a membrane). However, with many wave energy converter designs operating as oscillatory pumps, they can be used to directly pressurize an RO system, potentially eliminating the need to purchase electricity.

- **Wave-powered desalination is more than just an economic challenge, it’s a technical challenge.** Both the capture of energy from waves and the application of water treatment technologies are valuable areas of innovation. A marine energy-powered system might have inherent system attributes and capabilities that go beyond existing requirements or incumbent technologies. Technical innovations are still needed to achieve a level of economic competitiveness.

- **Desalination without electricity consumption is a compelling technological challenge with potential benefits beyond drinking water.** Many of the advances from this competition could find integration in other applications for marine energy technologies. For example, directly pressurizing a system might be an attribute of an aquaculture or marine algae farm, or it could be applied to direct seawater adsorption systems. The efforts undertaken in the prize might have broad application across many new opportunities for marine renewable energy.

---

Wave-powered desalination could shift costs from variable to fixed. Either by directly supplying electricity via wave energy, or by eliminating the need for electricity through pressurizing, the variable costs of grid-scale or diesel-based systems could be eliminated, which would allow operators to better control and predict operational costs.

Stage I: CONCEPT—Closed

On November 14, 2019, DOE announced the winners of the CONCEPT Stage. The winners of the first stage can be found HERE.

Stage II: DESIGN Rules and Requirements

Introduction

The Waves to Water Prize is a four-stage contest seeking to accelerate the development of modular, flexible, and easily transportable systems using wave power to desalinate ocean water, providing clean water in areas of the world facing disaster relief and recovery scenarios, or providing water to remote, high-cost, and water-scarce coastal and/or island locations with little infrastructure support. The purpose of the DESIGN Stage is to challenge competitors to:
(1) clearly demonstrate the technical feasibility and analytical evidence of a concept, and (2) develop a plan to build a proof of concept and demonstrate a pathway to field deployment.

This second DESIGN Stage invites competitors to develop and submit a Technical Narrative and Modeling Documentation that includes:

- Information on how the system meets the goals of the prize, as explained in Section 1.1;
- A plan for how the competitor intends to fabricate a functional or proof-of-concept prototype in the subsequent CREATE Stage, and a preliminary plan for testing in open water in the DRINK Stage; and
- Modeling of the performance of the proposed system under wave conditions provided in these rules.

WPTO is looking to award prizes to competitors that have a strong likelihood of going on to compete and win in Stage IV: DRINK and can feasibly build a prototype that is ready for ocean testing in time to compete in the DRINK Stage.

Submissions should demonstrate that the systems in this DESIGN Stage will be able to meet the Minimum System Technical Requirements in the table below.

DESIGN Stage Prizes

- Prize Pool Up to $800,000
- Between 10 and 20 Prize Winners split prize pool equally, with a maximum of $100,000 for an individual prize
### Minimum System Technical Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality</td>
<td>Must be able to produce water with a maximum TDS level of 1,000 mg/L.²</td>
</tr>
<tr>
<td>Produced Volume</td>
<td>At least 400 liters of water over the 5-day testing period.</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>Systems cannot exceed 650 kg.</td>
</tr>
<tr>
<td>48-Hour Setup</td>
<td>Systems must demonstrate that they can be set up in under 48 hours.</td>
</tr>
<tr>
<td>Storage Capabilities</td>
<td>Batteries are not a requirement of the system; however, no more than 5 kWh of batteries can be included. Once these batteries are discharged, the batteries must ONLY be powered by wave energy.</td>
</tr>
<tr>
<td>Other Energy Sources</td>
<td>All energy for desalinating water must come from wave energy. No other renewable sources will be allowed for the primary function of desalination (i.e. Tidal, Solar, Wind, etc.). However, other energy sources can be used for ancillary purposes.</td>
</tr>
</tbody>
</table>

The competitors that demonstrate they have the technical capability to build a functional or proof-of-concept prototype will be awarded a cash prize that can be used to supplement prototype costs for the CREATE Stage.

The following rules are for competitors in the DESIGN Stage. “You” and “your” reference competitors in this stage. Any eligible competitor can compete in this stage, even if you did not compete in the CONCEPT Stage. There are no limits on the number of submissions from any one team.

### How to Enter

Complete a submission package online at [https://www.herox.com/WavestoWater](https://www.herox.com/WavestoWater) before the contest closing date.

---

² While this is the maximum TDS level for water quality, WPTO is seeking any concepts that demonstrate that the water produced by the system is potable, as according to EPA standards. It is anticipated in the DRINK stage that higher scoring will be awarded to competitors that meet or exceed EPA drinking water standards.
Important Dates

Opening of DESIGN Stage: November 14, 2019
Close of DESIGN Stage: March 13, 2020
Expected Winner Notification: May 2020

What to Submit

The following items constitute the submissions package and must be submitted through the HeroX platform:

- Cover Page Content (to be made public, not scored)
- Submission Summary Slide (to be made public, not scored)
- Technical Narrative (scored)
- Modeling Documentation (scored)
  - In order for a submission to be eligible for review, the two required tables must be populated: (1) Water Production Modeling Results Table; and (2) Wave Energy Converter Modeling Results Table.

- Optional: Letters of Commitment or Support

Cover Page Content

Cover Page—List basic information about your submission (will be made public)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td><strong>Key project members (names, contacts, and links to their other professional online profiles)</strong></td>
</tr>
<tr>
<td><strong>Short description</strong></td>
<td><strong>Your city and state</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Other partners (if any)</strong></td>
</tr>
</tbody>
</table>

---

3 Competitors who do not want the Technical Narrative, Modeling Documentation, or other documents to be made public will need to mark them according to the instructions in Section 10 of Appendix 1.
Submission Summary Slide

Submission Summary Slide (will be made public)

Make your own public-facing, one-slide submission summary that contains technically specific details but can be understood by most people. There is no template, so feel free to present the information as you see fit. Please make any text readable in a standard printout and conference room projection.

Scored Items: Technical Narrative and Modeling Documentation

There are two items required, the Technical Narrative and Modeling Documentation.

- **Technical Narrative**: The Technical Narrative should address the innovation potential, technical feasibility, system scalability, and other benefits, and the overall build plan. There are 17 statements used to evaluate the Technical Narrative.

- **Modeling Documentation**: The Modeling Documentation asks competitors to explain their modeling approach, demonstrate that modeling of their system is adequate for the proposed technologies, and that their proposed system is capable of achieving the competition’s minimum system technical requirements if operated in the parameters described in the Wave Conditions Table. This includes populating two key tables: (1) Water Production Modeling Results Table; and (2) Wave Energy Converter Modeling Results Table. These must be filled out in your submission, or the submission will be deemed ineligible. There are three statements used to evaluate the outcomes and approach of modeling.

Each statement for the Modeling Documentation and Technical Narrative will be scored based on a 1–6 scale, as shown below.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Slightly Disagree</td>
<td>Slightly Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

The Technical Narrative and Modeling Documentation scoring will be used to calculate the final score. The Technical Narrative and Modeling Documentation statements will each be rated on a scale of 1–6. The Modeling Documentation scores will have a 5x weighting applied. The Technical Narrative and weighted Modeling Documentation scores will be totaled to produce the final score.

The table below explains the manner in which the final scores for each submission will be calculated:
Technical Narrative

There are four criteria you will be evaluated against for your Technical Narrative. You can use **up to 5,000 words and up to 10 supporting images, figures, or graphs** to populate the template provided on HeroX. Key findings from your modeling efforts should be included in your Technical Narrative to address the four criteria.

The four criteria are as follows:

- **Criteria 1: Innovation**—Does your system represent a novel solution that can deliver water during disaster relief and recovery and in remote coastal communities?
- **Criteria 2: Technical Feasibility**—Is your solution technically feasible?
- **Criteria 3: Scalability and Other Benefits**—Does your proposed solution have additional attributes or produce other benefits that would be valuable for other applications beyond the prize?
- **Criteria 4: Plan**—What is your plan to achieve your goals?

The table below suggests content for you to provide and the statements used to evaluate your Technical Narrative. The content bullets are only suggestions to guide your responses; you decide where to focus your response. You should incorporate any key findings from your modeling efforts to address the judgment criteria.

### Criteria 1: Innovation—Does your system represent a novel solution that can deliver water in disaster relief and recovery and in remote coastal communities?

<table>
<thead>
<tr>
<th>Suggested Content You Provide</th>
<th>Each Statement Scored on 1–6 Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• How this solution is unique from what has been demonstrated or is currently available.</td>
<td>• The proposed solution presents an innovative approach to wave-powered desalination systems.</td>
</tr>
</tbody>
</table>
● Any novel or unique material technologies, fit-for-purpose water quality technologies, wave energy capture technologies, or any other choices driving innovation.

● The integration challenge between the proposed wave energy technology and desalination technology and your innovative solution.

● How this technology is specifically suited to serve remote communities and/or disaster response and recovery scenarios. This can include ease of operation, how a system can be operated by a broad range of end users, ease of transport, or other characteristics.

● Any measures to increase the reliability of the system over a timespan longer than the competition. This can include measures of survivability, reduced intervention strategies, or other measures that would allow for longer operation of the system.

● If any other operational strategies are planned for operating in higher energetic sea states, they must be credibly described.

● The desalination process includes innovative elements or fundamental advances in water treatment against incumbent solutions.

● The proposed solution has unique attributes that make it more likely to serve the needs of a coastal community than incumbent or existing technologies.

● The proposed solution has attributes that enable the system to operate beyond a 5-day testing period.

Criteria 2: Technical Feasibility—Is your solution technically feasible?

Suggested Content You Provide

● Deployment and installation plan, including major assumptions for time to deploy the system at a test site and a disaster response scenario where there is large uncertainty around site conditions.4

● Describe specific installation strategies including any special equipment that is needed for installation, in a narrative of how the device will be installed in a near-shore location (less than 500 meters from shore).

Each Statement Scored on 1–6 Scale

● The wave energy device demonstrates a feasible deployment and installation approach, and can be practically unpacked, assembled, and deployed in less than 48 hours once on site.

● The proposed solution is free of any major technical flaws on the wave energy extraction method.

● The proposed solution is free of any major technical flaws in the desalination method for the provided quality and quantity of

4 For this DESIGN Stage, competitors can assume having access to “readily available” equipment (e.g., two-person dinghy, etc.).
● Technology risks/challenges (e.g., equipment, material, or processes) associated with your concept and how they will be mitigated.

● Design strategies relevant to survivability, and the widest range of wave conditions.

● The wave energy principles, desalination system, and any integration systems necessary.

● Conceptual drawings (e.g., images of 3D CAD drawings, etc.). The drawings should include overall system dimensions.

● Description of packaging of the system and how the system will fit into the specified shipping container.

● Wave energy systems must include mooring and/or foundation assumptions that are required. It is anticipated that teams may use limited local materials, such as rocks and sand, and can be included in these mooring and/or foundation assumptions.

● If the system uses electricity from the wave device, describe any storage capabilities associated with the system.

● How the desalinated water will be delivered. This should include any retrieval methods, and/or water delivery methods.

● The risks associated with the proposed solution are well understood and articulated.

● The submission adequately describes how the entire system, including all necessary equipment needed to assemble and operate the system, fits in the shipping container.

● The water delivery system is adequately described and requires minimal human intervention to maintain water supply over the anticipated test period.

Criteria 3: Scalability and Other Benefits—Does your proposed solution have additional attributes or produce other benefits that would be valuable for other applications beyond the prize?

Suggested Content You Provide

● Other additional benefits that would be attractive to industry or end users, beyond just water production and water quality metrics.

● Describe the manufacturability of your system, including expected processes.

● The unique value proposition of your solution.

Each Statement Scored on 1–6 Scale

● The proposed system has additional value propositions or revenue streams that may be desirable for end users with limited access to drinking water or robust infrastructure.

● The proposed solution can be mass produced with widely used manufacturing processes or leverages off-the-shelf components.
- The scalability of your solution to other market or technological applications.
- Potential for generation of additional revenue streams or innovative business model developments beyond drinking water production.
- Describe any reuse, harvesting, or utilization of brine discharge or other waste streams by the desalination system.
- Describe any advancements in environmental risk mitigation strategies, or other sustainability considerations.
- Additional consideration of end-user requirements or needs.

### Criteria 4: Plan—What is your plan to achieve your goals?

<table>
<thead>
<tr>
<th>Suggested Content You Provide</th>
<th>Each Statement Scored on 1–6 Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Describe your SMART(^5) goals for the CREATE Stage, which should include demonstrating a functional prototype. A functional prototype may be, but is not limited to, a scale prototype. The intent of the prototype is to demonstrate working principles and/or to de-risk the technology prior to the DRINK Stage.</td>
<td>- The stated goals are ambitious, reduce risks and show a commitment to demonstrating their technology at the conclusion of the DRINK Stage.</td>
</tr>
<tr>
<td>- In defining your SMART goals, include quantified, risk-reducing, meaningful, practical, and testable interim milestones.</td>
<td>- Meeting the stated goals will demonstrate critical progress towards developing, testing, and validating the functionality of this innovation.</td>
</tr>
<tr>
<td>- Describe your strategy to develop a proof-of-concept of your technology in the CREATE Stage; providing preliminary fabrication plan, diagrams, or other materials is encouraged but not required.</td>
<td>- The proposed plan for the CREATE Stage is reasonable given the time allocated and the team's available resources.</td>
</tr>
<tr>
<td></td>
<td>- The team’s drive, knowledge, and complementary skillsets provide a strong competitive edge and assurance that the team will be able to deploy a system for ocean testing at the end of the prize.</td>
</tr>
</tbody>
</table>

---

\(^5\) SMART Goals: Use only specific, measurable, achievable, relevant, and timely (SMART) outcome-based goals, not activity-based, so that a neutral third-party can validate them (if possible).

- For example: Demonstrate a definitive achievement of progress (e.g., “X letters on interest signed” or “achieves X% efficiency.”) Do not describe how you spent your time (e.g., “provide a report,” “talk to customers,” or “perform experiments”).
● Provide a high-level budget and plan to meet your goals between the conclusion of the DESIGN Stage and the DRINK Stage, including how you will leverage program resources or other entities (include references to letters of support/commitment if applicable).

● Describe your team’s readiness to meet your goals and if additional talent and resources are needed.

● This innovation, team, and plan should be strongly considered for a DESIGN Stage prize (score only a 1 or a 6).

Modeling Documentation

To describe your modeling methodologies and findings underpinning your response in the Technical Narrative, you can use up to 2,500 words and up to 10 supporting images, figures, or graphs in the template provided on HeroX. The 2,500 words are limited to findings and methodologies from modeling efforts. The required tables do not count against your 10 supporting images, figures, or graphs. Modeling is defined as any effort to analyze or simulate an intended design by delivering quantified results that are accurate and reasonable. Any information beyond modeling findings and modeling efforts will not be considered when scoring. The Water Production Results Table and the Wave Energy Converter Modeling Results Table must be filled out in your submission, or the submission will be deemed ineligible.

The table below has the evaluation criteria that will be used to score the modeling documentation.

<table>
<thead>
<tr>
<th>Eligibility Criteria:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the Water Production Results Table and the Wave Energy Converter Modeling Results Table populated? Yes/No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review Criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each Statement Scored on 1–6 Scale</td>
</tr>
<tr>
<td>● The proposed solution demonstrates through modeling that it is easily adaptable to a wide range of wave resource conditions.</td>
</tr>
<tr>
<td>● The methods and assumptions used for modeling and simulation are appropriate given the physics of the proposed solution.</td>
</tr>
<tr>
<td>● The modeling efforts give the reviewer confidence that the proposed solution will exceed all of the Minimum System Technical Requirements.</td>
</tr>
</tbody>
</table>
Each submission must predict the performance of the proposed system using an appropriate modeling approach given the technology being assessed. The models will be used to evaluate the anticipated performance, water production, and water quality of each submission.

All submissions must evaluate their technology for each of the 6 wave conditions listed under the System Technical Requirements section with an assumed water depth of 5 meters. It should be noted that the actual site conditions are likely to be between 2- and 5-meter water depths, but to ensure all systems are capable of being deployed at the deeper end of the spectrum, and to maintain consistency across submissions, modeling efforts should use a 5-meter water depth assumption. The 6 wave conditions are representative of the range of wave conditions that are likely to be present during the final contest.

In addition to the desalination treatment stage, any pre-treatment or post-treatment of water that is included should be modeled and/or described, including any energy or water losses, assumptions, and target values for potability. Competitors may want to consider additional measures to have their systems deliver potable water as WPTO plans to include additional potability metrics/requirements in the CREATE and DRINK Stages. Potability parameters for the next stage of the competition could include conductivity, turbidity, pH, dissolved oxygen, and temperature.

Key Assumptions

- Any assumptions or base parameters that are required to predict system performance (assume 35,000 ppm seawater salinity).
- The system should be modeled using the specified sea states described in the Wave Conditions Table under Minimum System Technical Requirements.

### Minimum System Technical Requirements

<table>
<thead>
<tr>
<th>Minimum System Technical Requirements</th>
</tr>
</thead>
</table>
| Water Quality | Must be able to produce water with a maximum TDS level of 1,000 mg/L.  
| Produced Volume | At least 400 liters of water over the 5-day testing period.  
| Shipping Weight | Systems cannot exceed 650 kg.  
| 48-Hour Setup | Systems must demonstrate that they can be set up in under 48 hours.  

6 While this is the maximum TDS level for water quality, WPTO is seeking any concepts that demonstrate that the water produced by the system is potable, as according to EPA standards. It is anticipated in the DRINK stage that higher scoring will be awarded to competitors that meet or exceed EPA drinking water standards.
Storage Capabilities

Batteries are not a requirement of the system; however, no more than 5 kWh of batteries can be included. Once these batteries are discharged, the batteries must ONLY be powered by wave energy.

Other Energy Sources

All energy for desalinating water must come from wave energy. No other renewable sources will be allowed for the primary function of desalination (i.e. Tidal, Solar, Wind, etc.). However, other energy sources can be used for ancillary purposes.

To address how your system will meet the Minimum System Technical Requirements above, the following information should be provided:

- Total system weight.
- How the entire system will fit into the specific container (internal dimensions 41 x 44 x 35 inches).
  - This includes any anchors or mooring configurations.
  - For the purposes of this stage, assume that local materials (e.g., sand, rock, etc.) can be used to reduce space requirements; however, availability of materials for the DRINK Stage cannot be guaranteed. It is expected that any anchoring system required for the operation of a proposed system must be contained within the prescribed shipping container.
  - The specified container can be utilized as part of the system.
- The system must be able to produce a minimum of 400 liters of water with no more than 1,000 ppm TDS over the specified set of sea states and distribution.
- Total water production must be estimated for a 5-day test period using the distribution of wave conditions listed below in the Wave Conditions Table. The specified “Time for Each Wave Condition [hours] [%]” should be used in order to estimate total water production over the 5-day (120-hour) test period.
- In order to ensure consistent modeling during the DESIGN Stage each system must be analyzed using a time-domain model assuming a Bretschneider spectrum as defined below:

\[
S(\omega) = \frac{5}{16} \frac{\omega_m^4}{\omega^5} H_s^2 e^{-5\omega_m^4/4\omega^4}
\]

  - Where \( \omega \) is the wave frequency, in radians per second, and \( \omega_m \) is the most likely frequency of any given wave and \( H_s \) is the significant wave height in meters. Here, significant wave height means the average height of the highest one-third of all waves measured.
  - For all wave conditions, regardless of spectra used, the simulation must be performed for a duration of at least 2,000 seconds to ensure the statistical average and peak values are adequately captured in the time-domain model. The production from each sea state will then be calculated using the average of the 2,000 second simulation multiplied by the time defined in the last column of the Wave Conditions Table.
- The modeling methodology must be described in adequate detail for reviewers to evaluate whether the modeling techniques are appropriate for the given wave and desalination technologies. This must include how the technologies are coupled, linked, or integrated.
Wave Conditions Table

<table>
<thead>
<tr>
<th>Sea State</th>
<th>Significant Wave Height [m]</th>
<th>Energy Period [sec]</th>
<th>Time for Each Wave Condition [hours] [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>0.5</td>
<td>6</td>
<td>26.4 (22%)</td>
</tr>
<tr>
<td>W2</td>
<td>0.5</td>
<td>10</td>
<td>6 (5%)</td>
</tr>
<tr>
<td>W3</td>
<td>1.0</td>
<td>6</td>
<td>33.6 (28%)</td>
</tr>
<tr>
<td>W4</td>
<td>1.5</td>
<td>7</td>
<td>26.4 (22%)</td>
</tr>
<tr>
<td>W5</td>
<td>2.0</td>
<td>7</td>
<td>26.4 (22%)</td>
</tr>
<tr>
<td>W6</td>
<td>3.0</td>
<td>7</td>
<td>1.2 (1%)</td>
</tr>
</tbody>
</table>

Reporting Key Findings

Water Production Results

The results of the model must include, at a minimum, the following:

- Intake rates (L/min);
- Clean water production rates (L/min);
- Total Dissolved Solids (TDS)—Proxy for salinity (mg/L); and
- Brine discharge rates (L/min), and brine discharge TDS (mg/L) for each wave condition.

Results must be calculated for each wave condition and submitted into the Water Production Results Table template provided below. Additional parameters are encouraged to demonstrate that the model(s) being used are at a high enough level of fidelity to understand the operating principles of each device. If additional parameters are included, please include them in a different table for simplified judging and review.

---

7Significant wave height means the average height of the highest one-third of all waves measured.
Water Production Results Table

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wave Energy Converter Modeling Results

The wave energy device should be modeled and must include the following parameters for each wave condition as listed in the Wave Conditions Table. The model outputs should be modeled for all six sea states listed in the Wave Conditions Table:

- **Average Absorbed Power:** The average absorbed power\(^8\) for the defined sea state prior to integration with the desalination system [kW].

- **Peak Absorbed Power:** The instantaneous peak absorbed power for the defined sea state prior to integration with the desalination system [kW].

- **Peak Mooring and/or Foundation Loads:** The instantaneous peak forces or reaction loads associated with mooring lines, anchor systems, or foundation systems [N].

---

\(^8\) Absorbed power is defined as the mechanical power that is being captured by the wave energy system and translated into mechanical work (e.g., translational or rotational shaft work).
Results must be calculated for each sea state and submitted in the Wave Energy Converter Modeling Results Table provided below:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above model outputs should be modeled for each specified irregular sea state.

- Assumed losses due to pumping or other parasitics (e.g., RO pump efficiencies, water delivery, etc.) must be described and/or quantified in the submission.

Letters of Commitment or Support

Attach one-page letters (of support, intent, or commitment) from other relevant entities (e.g., potential users of the proposed innovation) to provide context. This could include letters of support from partners or others that you believe are critical to the success of your proposed solution. Please do not submit multi-page letters.

How We Determine Winners

The Prize Administrator screens all completed submissions and, in consultation with DOE, assigns reviewers to independently score the content of each submission. The reviewers will be composed of federal and non-federal subject matter experts with expertise in relevant areas. Reviewers will review DESIGN Stage submissions according to the described evaluation criteria.
The Prize Administrator will tally the scores based on the scoring criteria described in Section 4.4 above. The Prize Administrator will present the scores to the DOE judge who may decide to interview some teams.

- **Interviews**: WPTO, at its sole discretion, may decide to hold a short interview with a subset of the DESIGN Stage competitors. The interviews would be held prior to the announcement of winners and would serve to help clarify questions the reviewers or judge may have. Attending interviews is not required and interviews are not an indication of winning.

- **Final Determination**: The Director of WPTO is the judge of the competition and will make the final determination. Final determination of winners by the judge will take the reviewers’ scores, any interview findings, and the judge’s review into account.

- **Announcement**: Approximately 45 days after the contest closes, the Prize Administrator notifies winners and requests the necessary information to distribute cash prizes. The Prize Administrator will then publicly announce winners.

**Additional Terms and Conditions**

See Appendix 1 for additional requirements. COMPETITORS THAT DO NOT COMPLY WITH THE ADDITIONAL REQUIREMENTS IN APPENDIX 1 MAY BE DISQUALIFIED.

MORE DETAILS ON RULES FOR EACH STAGE WILL BE PROVIDED PRIOR TO THE OPENING OF EACH SUBSEQUENT STAGE.
Stage III: CREATE Stage Rules and Requirements

**Overview**

Competitors in the CREATE Stage will have 180 days to build and document a proof of concept or functional prototype of their wave-powered desalination system and develop a plan to participate in the DRINK Stage of the prize. Requirements for this stage will include:

- Delivery of video demonstrating the operating principles and a functioning system;
- Technical document that demonstrates the feasibility of the system, and how the system functions; and
- A plan for how the full-scale system will be developed and delivered for testing at the DRINK Stage.

Any eligible competitor can compete in this stage, even if they did not compete in the CONCEPT or DESIGN Stages. Successful competitors will be invited to build their full system and ship to the test site at the end of the DRINK Stage. No new competitors will be allowed entry into the prize after the CREATE Stage.

**Prizes**

The CREATE Stage offers between 5 and 10 winners that will be awarded equally from a total prize pool up to $500,000. The prize pool will be shared equally by the number of winners not exceeding 10, with a $150,000 maximum prize, even if the number of winners is less than 4.

**ANNOUNCEMENT**—Approximately 45 days after the contest closes, the Prize Administrator notifies winners and requests the necessary information to distribute cash prizes. The Prize Administrator will then publicly announce winners.

**Important Dates**

- **Expected Start:** May 2020
- **Expected Close:** September 2020
- **Expected Winner Notification:** October 2020
Stage IV: DRINK Stage Rules and Requirements

Overview

Winners of the CREATE stage will have up to 180 days to build and ship their systems to conduct a test for up to 5 days at an open ocean testing environment. The competition will culminate in a demonstration, to include up to 5 days of testing, to demonstrate their solutions at an ocean test site and compete on efficiency, logistics, and system integration metrics. The prize competition will be held in an open ocean, nearshore environment. DRINK competitors will be evaluated against the plan they propose at the end of the CREATE Stage.

Systems will be uncrated and deployed using “readily available” equipment (e.g., two-person dinghy, etc.), and will be timed. The systems will be required to operate for 5 days. During the 5 days, teams will also be evaluated on the amount of time they intervene (e.g., cleaning, water delivery, tuning, etc.) in the contest. A collection tank for each competitor will be provided.

Additional details for the DRINK Stage can be found in Appendix 2.

Prizes

At the end of the testing period the devices will be evaluated based on the requirements and metrics and a Grand Prize winner will be awarded. Multiple winners will be selected, including:

- **Grand Prize:** A Grand Prize in the amount of $500,000 will be awarded to the competitor with the best overall score.
- **Individual Metrics Prizes:** There will be other prizes awarded to the competitors for a total prize pool of $500,000.

**Assessment**—WPTO will select the winners of this stage, based on the performance of the systems from the 5-day test period.

**Announcement**—The Prize Administrator and WPTO intend to announce the winners at the end of the open-water testing period.

Important Dates

- **Expected Start:** October 2020
- **Expected Close:** March 2021

---

**DRINK Stage Prizes**

- Prize Pool Up to $1,000,000
- 1 Grand Prize $500,000 Winner
- Individual Metrics Prizes Up to $500,000 with Multiple Winners
Expected Testing at Demonstration Site: April 2021

Expected Winners Announced: April 2021
Appendix 1—Additional Terms and Conditions

Requirements

Your submission for the Waves to Water Prize is subject to the following terms and conditions:

- You must post the final content of your submission or upload the submission form online at https://www.herox.com/WavestoWater Prize before the CONCEPT Stage closes. Late submissions or any other form of submission may be rejected.

- All submissions that you wish to protect from public disclosure must be marked according to the instructions in Section 10 of Appendix 1. Unmarked or improperly marked submissions will be deemed to have been provided with unlimited rights and may be used in any manner and for any purpose whatsoever.

- You must include all the required submission’s elements. The Prize Administrator may disqualify your submission after an initial screening if you fail to provide all required submission elements. Competitors may be given an opportunity to rectify submission errors due to technical challenges.

- Your submission must be in English and in a format readable by Microsoft Word or Adobe PDF. Scanned hand-written submissions will be disqualified.

- Submissions will be disqualified if they contain any matter that, in the sole discretion of DOE or the Prize Administrator, is indecent, obscene, defamatory, libelous, lacking in professionalism, or demonstrates a lack of respect for people or life on this planet.

- If you click “Accept” on the HeroX platform and proceed to register for any of the stages described in this document, these rules will form a valid and binding agreement between you and the U.S. Department of Energy and are in addition to the existing HeroX Terms of Use for all purposes relating to this contest. You should print and keep a copy of these rules. These provisions only apply to the contest described here and no other contest on the HeroX platform or anywhere else.

- The Prize Administrator, when feasible, may give competitors an opportunity to fix non-substantive mistakes or errors in their submission packages.

Verification for Winner Payments:

The Prize Administrator will verify the identity of a participant selected to receive the prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrator will notify winning participants using provided email contact information after the date that results are announced. Each participant will be required to sign and return to the Prize Administrator, within 30 days of the date the notice is sent, a completed NREL Request for ACH Banking Information form, and a completed W9 form (https://www.irs.gov/pub/irs-pdf/fw9.pdf). In the sole discretion of the Prize Administrator, a winning competitor will be disqualified from the competition and receive no prize funds if: (i) The person/entity cannot be contacted; (ii) the person/entity fails to sign and return the required documentation within the required time period; (iii) the notification is returned as undeliverable; or (iv) the submission or person/entity is disqualified for any other reason.
Teams and Single Entity Awards

The Prize Administrator will award a single dollar amount to the designated primary submitter whether consisting of single or multiple entities. The primary submitter is solely responsible for allocating any prize funds among its member competitors as they deem appropriate.

Submission Rights

By making a submission, and consenting to the rules of the contest, a competitor is granting to DOE, the Prize Administrator, and any other third parties supporting DOE in the contest, permission to use the submission consistent with the Rules of this Prize. Portions of submissions that are marked as protected from public disclosure according to Section 10 of Appendix 1 will be treated accordingly. Potential uses of submissions include posting or linking to the non-protected portions of the submission on the Prize Administrator or HeroX platforms, including the contest website, DOE websites, and partner websites, and the inclusion of the submission in any other media, worldwide. The submission may be viewed by the DOE, administrator, and judges for purposes of the contest including but not limited to screening and evaluation purposes. The Prize Administrator and any third parties acting on their behalf will also have the right to publicize competitor’s name and, as applicable, the names of competitor’s team members and organization, and the abstract for their idea at the CONCEPT Stage on the contest website indefinitely.

By entering, Competitor represents and warrants that:

1. Competitor has not included third-party content (such as writing, text, graphics, artwork, logos, photographs, dialogue from plays, likeness of any third party, musical recordings, clips of videos, television programs or motion pictures) in or in connection with the submission, unless (i) otherwise requested by the Prize Administrator and/or disclosed by Competitor in the submission, and (ii) Competitor has either obtained the rights to use such third-party content or the content of the submission is in the public domain without any limitations on use;

2. Unless otherwise disclosed in the submission, the use thereof by Prize Administrator, or the exercise by Prize Administrator or others acting on its behalf of any of the rights granted by Competitor under these rules, does not and will not infringe or violate any rights of any third party or entity, including, without limitation patent, copyright, trademark, trade secret, defamation, privacy, publicity, false light, misappropriation, intentional or negligent infliction of emotional distress, confidentiality, or any contractual or other rights;

3. Competitor is not and will not conduct any activity pertaining to this prize competition that would infringe upon any intellectual property right of any third party or entity, including, without limitation patent, copyright, trademark, trade secret, or other intellectual property right; and that it has exercised reasonable efforts and diligence in making this representation and warranty. The foregoing representation and warranty shall be ongoing during the course of this competition and will be considered to have been made again and as of the date of each subsequent stage of the competition in which Competitor participates.

4. All persons who were engaged by the Competitor to work on the submission or who appear in the submission in any manner have:
   a. Given Competitor their express written consent to submit the submission for exhibition and other use in any manner and in any and all media, whether now existing or hereafter discovered, throughout the world;
b. Provided written permission to include their name, image, or pictures in or with the submission (or if a minor who is not Competitor’s child, Competitor must have the permission of their parent or legal guardian) and Competitor may be asked by Prize Administrator to provide permission in writing;

Copyright

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

Contest Subject to Applicable Law

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

Resolution of Disputes

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

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

In the event of a dispute as to any registration, the authorized account holder of the email address used to register will be deemed to be the participant. The “authorized account holder” is the natural person or legal entity assigned an email address by an Internet access provider, online service provider, or other organization responsible for assigning email addresses for the domain associated with the submitted address. Competitors and potential winners may be required to show proof of being the authorized account holder.

Publicity

The winners of these prizes (collectively, “Winners”) will be featured on the DOE and NREL websites.

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

Liability

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

In accordance with the delegation of authority to run this contest delegated to the Director of the Water Power Technology Office, the Director has determined that no liability insurance will be required of participants to compete in this competition per 15 USC 3719(i)(2) in the Stage I: CONCEPT Stage. The Director will evaluate possible activities in the rest of the Stages and make additional determinations. Participants may be required to obtain liability insurance in future stages.

**Submission Marking and FOIA**

All materials submitted to DOE as part of a submission become DOE records. Any confidential commercial information contained in a submission should be designated in writing at the time of submission.

Participants are required to employ protective markings in the following manner:

The cover sheet of the submission must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes. 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 trade secrets or commercial or financial information that is privileged must be marked as follows: “May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure.”

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

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

**Privacy**

If you choose to provide HeroX with personal information by registering or completing the submission package through the contest website, you understand that such information will be transmitted to DOE and may be kept in a system of records. Such information will be used only to respond to you in matters regarding your submission and/or the contest unless you choose to receive updates or notifications about other contests or programs from DOE on an opt-in basis. DOE and NREL are not collecting any information for commercial marketing.
Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-federal personnel. The Government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to EERE providing their response to non-federal parties. Non-federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

**General Conditions**

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

Although DOE indicates in the Waves to Water Prize stages that it will select up to several winners for each stage, DOE reserves the right to only select competitors that are likely to achieve the goals of the program. If, in DOE’s determination, no competitors are likely to achieve the goals of the program, DOE will select no competitors to be winners and will award no prize money.

DOE reserves the right to request additional and/or required documentation from the competitors within a reasonable time after the close of the competition.

**Prize Administrator**

The Prize Administrator is the Alliance for Sustainable Energy, LLC operating in its capacity as the Managing and Operating Contractor for the National Renewable Energy Laboratory (NREL). The U.S. Department of Energy, Water Power Technologies Office (WPTO) is the Federal Agency sponsor of the prize.

**National Environmental Policy Act (NEPA) Compliance**

DOE’s administration of the Waves to Water Prize is subject to NEPA (42 USC 4321, et seq.). NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE’s NEPA website, at http://nepa.energy.gov/.

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

**Judge Conflict of Interest**

The judge of this prize may not (a) have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in the Prize; or (b) have a familial or financial relationship with an individual who is a registered participant.
ALL DECISIONS BY DOE ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CONTEST.
Appendix 2—Additional DRINK Technical Goals Details

This appendix covers aspirational goals of WPTO for the DRINK Stage of this contest. The system requirements here are provided to give competitors a view of what may be required of them in the DRINK Stage but are subject to change.

Site Testing Conditions

All solutions competing in the DRINK Stage will be evaluated at an open-water test site with the following anticipated site characteristics:

- Significant wave height range⁹ between 0.5 m and 2.0 m;
- Average wave period range between 5 and 15 seconds;
- Water depth between 2 and 5 m; and
- Deployed less than 1 km from shore.

This is an estimated range of conditions expected for the testing site. It is anticipated that the site will be representative of average- to low-energetic wave resources, and at the bottom end of the ranges provided. Once a final test site has been selected, full technical details will be provided.

Ease of Deployment

In the DRINK Stage, solutions will need to address the ability to deploy quickly and easily in a disaster response scenario where there is large uncertainty around site conditions. Competitors should aim for systems that can be deployed in under 48 hours. Proposals should also consider how the water would be delivered to the shore. This could include either pumping or transport between the device and shore. At the DRINK stage, there will be a set time for maintenance or transport from the device to the shore.

Set Shipping Container Size

In the DRINK Stage, competitors will be required to have their entire system fit within a standardized container. The container that has been selected is a standard, commercial, off-the-shelf container that is approximately 45 x 48 x 42 inches (e.g., DuraGreen DGR454842). The internal dimensions that all system components must fit inside are approximately 41 x 44 x 35 inches. The contest is seeking technologies that can fit into a predefined container to standardize the shipping constraints that face many disaster response and recovery scenarios. A standard container enables a direct comparison with other energy solutions (i.e., solar, gasoline/diesel generator, etc.) by ensuring that whatever system is being deployed has the same shipping and logistics limitations. Specifically, the prize is targeting locations that may have damaged infrastructure and therefore may have limited access to on-road transportation. For this reason, the container that has been selected is sized so that any light-duty pickup truck will be able to transport a single unit to its final location. WPTO may supply the final contestants with

⁹ Wave height range defined here: https://www.weather.gov/key/marine_sigwave
one container to ensure that every competitor at the final DRINK Stage has the same shipping constraints.

**Water Quality**

Globally, 97% of seawater ranges from 33,000 to 37,000 total dissolved solids (TDS) mg/L, but can range up to 45,000 mg/L in the Persian Gulf. TDS in produced water of current saltwater reverse osmosis plants ranges from 100 to 400 mg/L (>99.4% rejection), which satisfies the TDS limitation (< 500 mg/L) as set by the Environmental Protection Agency (EPA) Secondary Drinking Water Standards. To make progress toward demonstrating wave powered desalination systems, in the DRINK Stage contest there will be both minimum threshold requirements for water quality as the output of the system and a target goal:

- **Maximum Level TDS:** 1,000 mg/L (World Health Organizations advises water with TDS concentrations less than 1,000 mg/L)
- **Target Level TDS:** Range of 300 to 600 mg/L TDS to achieve generally good acceptability in terms of taste.

Ultimately the prize seeks to produce drinking water at the final DRINK Stage of the competition that meets both EPA’s Secondary Standards and mandatory limits of the National Primary Drinking Water Regulations.

Local water quality will vary considerably across different regions, and it is necessary to design systems so that fit-for-purpose pretreatment and post treatment can be adopted with minimum efforts. Disinfection technology that functions without chemical consumption is also important to establish for remote communities with limited operational capacity. Examples include UV, laser (local temperature increase for short time), or ultrasonication can prevent biofouling and reduce operating cost, including chemical cost. WPTO has yet to make a final decision on whether systems will be required to include disinfection technologies in the DRINK Stage.

**Flexibility of Systems**

It is important that the wave energy converter systems paired with these desalination systems be adaptive to varying wave resources. Ocean waves are time-varying and site-varying in wave frequencies.

---

10 National Academy of Science 2008

11 Water containing TDS concentrations below 1000 mg/L is usually acceptable to consumers, although acceptability may vary according to circumstances. However, the presence of high levels of TDS in water may be objectionable to consumers owing to the resulting taste and to excessive scaling in water pipes, heaters, boilers, and household appliances (see hardness). Water with extremely low concentrations of TDS may also be unacceptable to consumers because of its flat, insipid taste; it is also often corrosive to water-supply systems.

12 World Health Organization 2003

and amplitudes. Competitors must develop systems that can operate under different wave conditions and different sites without major tuning to ensure operation at a wide variety of locations. Traditionally, early prototypes of wave energy devices have been designed to be tested in controlled environments. But, given the unpredictability of post-disaster recovery conditions, and variety of conditions at sites with remote community needs, these systems need to work in a variety of wave conditions.

**Environmental Benefits and Management**

Brine discharge, or other salt concentration issues from the process of desalinating water, will need to be managed effectively depending on existing environmental regulations. The development of zero or near-zero liquid discharge technologies can be tactically important toward achieving highly efficient desalination systems. In addition, it is important that desalination systems do not introduce biological or chemical contaminants, such as unregulated or nontraditional constituents (e.g., Boron). Brine management strategies that effectively address both the economic and environmental cost of brine diffusion, disposal, or other applications will be encouraged. Specific strategies that are robust across a variety of feedwater types could also be critical for some applications and should be considered. Another critical factor might be the tradeoff between concentrating brine recovery versus brine volume and determining an optimal level of water production to resource recovery. Finally, truly innovative brine reuse or application are of interest.

Additionally, consideration will be given to system recovery, cleanup and possible re-deployment. At a minimum, technology that is deployed at the test site will have to be completely removed from the test site at the end of the testing period.