

Modifications

All modifications to the Request for Information are **[HIGHLIGHTED]** in the body of the RFI.

Mod. No.	Date	Description of Modification
0001	3/18/2019	Page 9 - Changed RFI Closing Date from March 15 to April 5

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

RFI: Waves to Water Prize

DATE: February 25, 2019
SUBJECT: Request for Information (RFI)

Description

The U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Water Power Technologies Office (WPTO) is seeking feedback on its proposed “Waves to Water” prize via this Request for Information (RFI). The Waves to Water prize seeks to address water security and energy needs in remote and coastal communities through small, modular, cost-competitive desalination systems that use the power of the ocean to provide potable drinking water.

The objective of this effort is to develop technology solutions that harness ocean energy to desalinate water. Through an anticipated multi-phased contest, the prize seeks to accelerate an innovation cycle timeline that can typically take years and support new innovators and organizations seeking to pair desalination systems with marine energy.

Background

Opportunity for Desalination to Serve Communities Worldwide

Consistent access to fresh water is a challenge for many remote or island coastal communities. Worldwide, about 30 percent of people —2.1 billion —lack access to safely managed, readily available drinking water. Of those, 844 million people do not even have basic drinking water service, including 263 million people who have to make a trip of at least 30 minutes to collect water¹.

Rural, coastal and island communities often rely on expensive shipments of fuel and water for drinking and other household uses. Additionally, electricity and water services are vulnerable to disruption during periods of bad weather or following natural disasters. Even in periods of relative calm, seawater intrusion contaminates local freshwater aquifers, and high operational energy costs have traditionally made desalination a costly option only relevant to large, well-capitalized municipal water systems.

Ocean Energy and Desalination Potential

¹ World Health Organization/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene, [Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and Sustainable Development Goal Baselines](#), July 2017.

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

Desalination is the process in which salts and other minerals are removed from a fluid, such as seawater. Reverse osmosis (RO) is a common method for seawater desalination, especially in the U.S. market, where the desalination market is anticipated to reach approximately \$344 million in capital expenditures and about \$195 million in operational expenditures by 2020 (Global Water Intelligence 2016).

Ocean energy has potential to provide localized or remote power for desalination where solar, wind, and diesel energy are currently the primary options. Coastal issues such as resilience, disaster recovery, and water scarcity could all directly benefit from the application of wave energy powered desalination systems competitive on price, water production, and reliability. Providing critical services and unique value based on the power and nature of wave resources, marine energy technologies could establish opportunities for deployment beyond the designed capabilities of incumbent technologies.

The United States has one of the most compelling and varied wave resources across its many coastlines, where integrating wave and seawater desalination has specific advantages:

- Wave energy is one of the few renewable energy technologies that can produce clean water without any electrons. RO traditionally requires reliable grid-connected power supply to provide continuous, high pressure across an RO membrane. However, by directly pressurizing an RO system, a wave energy system could potentially bypass this cost.
- Direct wave to desalination systems shift the largest cost component from an operational expenditures cost to a capital expenditure cost. In a wave powered system, this cost is amortized through the capital cost of a wave energy converter; once installed the potable water is essentially free except for minimal maintenance costs.
- 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 - to get there significant technical innovations are needed. This competition aims to kick start development between state of the art wave capture technologies and desalination systems.

In addition to the advantages listed above, desalination without electricity 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.

To realize the opportunity for wave power, this prize is being proposed to develop a wave

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

powered desalination system that produces potable water under realistic shipping, transportation, and installation constraints. These constraints will be realized in the form of a pre-defined, standard shipping container with a realistic weight limit or other specifications. The pre-defined shipping container will constrain contestants to develop technologies that are capable of being transported with readily available equipment. These constraints will also enable a comparison between wave energy and competing commercial technologies.

Competing Technologies and Solutions

The three competing technologies (diesel, solar, bottled water) have varying strengths and weaknesses as described in Table 1.

Table 1. Competing Technology Strengths and Weaknesses

Competing Technology	Strengths	Weakness
Water Bottles	<ul style="list-style-type: none"> • Immediate response • Minimal operating costs 	<ul style="list-style-type: none"> • Finite volume with no replenishment • Waste from bottles
Diesel powered RO	<ul style="list-style-type: none"> • 24-hr Operation • Operation independent of weather 	<ul style="list-style-type: none"> • Limited volume available for fuel • Cost of diesel and delivery
PV powered RO	<ul style="list-style-type: none"> • No fuel requirement 	<ul style="list-style-type: none"> • 8-12 hour operation • Cloud cover directly impacts production

In order to incentivize technologies that have strong commercial potential, prize participants will have to consider the attributes of each competing technology in addition to the potential attributes of other desalination technology pathways.

General Structure of the Prize

The prize provides innovators a pathway from initial concept, to technical design, to prototype, to field tested systems that provide clean, accessible drinking water using only ocean waves as a power source. The prize is envisioned in three stages:

1. Capture and evaluate business cases and concepts for small-scale modular wave power desalination;
2. Demonstrate desalination and marine renewable energy integration; and
3. Validate technologies in a field test setting that meet quantifiable benchmarks for freshwater production, ease of installation, cost and reliability/survivability.

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

The Waves to Water prize intends to support the reception of innovative proposals from entities for which the barriers to apply through traditional funding vehicles would otherwise be too high, including small businesses and universities.

Water Security Grand Challenge

This prize supports and amplifies the White House initiated, U.S. Department of Energy led Water Security Grand Challenge², launched on October 25, 2018. The prize is aligned with multiple Water Security Grand Challenge goals for 2030, including:

- Launch desalination technologies that deliver cost-competitive clean water; and,
- Develop small, modular energy-water systems for urban, rural, tribal, national security, and disaster response settings.

Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on its scope and evaluation for the Waves to Water Prize. EERE is specifically interested in information on how to best structure a multi-phase prize contest to attract novel systems that use marine energy to desalinate water.

Disclaimer and Important Notes

This is solely an RFI and not a Funding Opportunity Announcement (FOA) or the opening of a prize; therefore, EERE is not accepting applications at this time. EERE may issue a prize in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a prize. There is no guarantee that a prize will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a prize regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

² <https://www.energy.gov/eere/water-security-grand-challenge>

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

Proprietary Information

Because information received in response to this RFI may be used to structure future programs and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously 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. Federal Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

Pages [List Applicable Pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI DE-FOA-0002096. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: “Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure” and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

Evaluation and Administration by Federal and Non-Federal Personnel

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

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Categories and Questions

Category 1: Key Areas of Innovation

Coupling ocean energy systems and desalination requires innovative technology solutions and optimization of systems, among other challenges. In Category 1, WPTO is seeking additional feedback and information on innovation needed, as well as current state of technologies.

1. While RO is the most widely deployed desalination technology over the last few decades, there are other technologies that have been explored, including forward osmosis, nanotechnology, engineered nano-materials, and ion concentration polarization. What are the merits of RO and other technologies when coupled with a wave energy or other renewable power system? Are there additional technologies not listed above?
2. What is the primary value proposition for wave powered desalination technologies?
3. What are the critical system integration challenges between wave energy technologies and current desalination technologies?
4. What are the common challenges to optimizing coupled renewable generation and desalination technologies systems?
5. Given the current state of desalination technologies, what are the recommendations on their relative versatility, modularity, and application of new technologies in small-scale and remote situations?
6. Are there specific technology hurdles that need to be overcome to enable a system to operate at “any” location (examples: energy-recovery, membrane, pump, distribution, etc.)?

Category 2: Technology Adoption

While the purpose of the prize is to accelerate the development of wave powered desalination systems, one of the key considerations is adoption of solutions – and continued development – by the private sector. As part of the design of the prize, WPTO seeks to incorporate input from ultimate intended users of these solutions..

1. Are there any specific demonstration efforts that the investment community will need to see prior to investing?
2. Is there a technology hurdle that needs to be overcome before a private funder will move forward with a technology (i.e. produce more water than solar, run time, etc.)?

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

3. What is an acceptable “installation” time or level of effort (i.e. number of people, special equipment, etc.) that must be beat for this to be a viable solution for remote communities?
4. What are the most important considerations to ensure ease of deployment in remote settings (e.g. coastal Alaska, Caribbean island communities)?

Category 3: Evaluation

One of the key considerations for the prize program is the general categories to evaluate contestants. This category contains draft evaluation criteria for different stages of the competition.

Concept Stage

1. *Level of Innovation*: Does the concept/technology advance the state-of-art? What are the impacts on time and cost?
 - a. Where is the innovation (desalination, WEC, integration?)
2. *Proof of Concept*: Has the applicant provided a proof of concept or described the process for proving and validating the concept?
3. *Feasibility of the Concept*: Is the concept technically, financially, and environmentally feasible?
4. *Risk Mitigation*: Potential risk associated with technology and how tech may reduce risk for project developers
5. *Team Experience*: What is the experience and credibility of the team or individual applicant?
6. *Manufacturing Scale-Up*: Can the design be easily adapted for mass production (do critical components require tight tolerances, high cost materials, etc.)?
7. *Adaptability*: How adaptable is the system for varying wave resources? Do critical components require re-design, does the system require tuning at each site, is it completely turn-key as is?

Testing and Evaluation

One of the key aspects of this proposed prize is that the competition will culminate in a final field deployment. As WPTO designs its metrics, feedback is requested on the following categories, technical targets, and achievable metrics for the competition:

1. What are the key metrics that represent technology advancement in this space?
2. What are appropriate standards to evaluate potability?
 - a. Does this include meeting Federal drinking water standards?
 - b. What is an appropriate maximum salinity requirement?
 - c. Are there specific testing protocols to capture these standards, given that conductivity is likely not enough, particularly for non RO technologies?

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

3. What scale matters to end users?
 - a. How many gallons of water per day from a wave energy desalination system is broadly relevant or impactful for end users?
4. What would be considered quick to deploy (minutes, hours, days)?
5. What would end users consider an acceptable maintenance interval?
6. What are the most important considerations for evaluating a testing/demonstration site to support the prize? For example, a market relevant wave climate or access to support staff and infrastructure?

Category 4: Use of Prize and Other Prize Structure Considerations

In addition to the scope and evaluation of the prize, WPTO is seeking comments on any of the following areas:

1. Clarity of the goal and fit with a prize model (as opposed to a grant or other mechanism);
2. Duplication with other ongoing activities;
3. Attractiveness of the question to a broad audience of possible solvers;
4. Time needed to develop a prize submission and for judges to identify a winner; and
5. Minimal dollar amount for the award that would make the prize attractive to solvers.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to WPTOPrizes@ee.doe.gov no later than 5:00pm (ET) on **April 5**, 2019. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) attachment to the email, and be no more than 10 pages in length, with 12-point font and 1-inch margins. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if applicable. Respondents may answer as many or as few questions as they wish.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the beginning of their response to this RFI:

- Company / institution name;
- Company / institution contact;
- Contact's address, phone number, and email address.

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.