



6450-01-P

DEPARTMENT OF ENERGY

Notice of Request for Information (RFI) on Critical Water Issues Prize Competition

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy (DOE).

ACTION: Request for information (RFI).

SUMMARY: The U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), seeks information from the public to understand the key technical and other barriers that may prevent long-term access to low-cost water supplies that could be best addressed through challenges and prize competitions. DOE may use the information provided through this Request for Information (RFI) to develop challenges and prize competitions to address low-cost water problems. For the purposes of this RFI, challenges and prize competitions are tools and approaches the Federal government and others can use to engage a broad range of stakeholders, including the general public, to develop solutions to difficult problems. Challenges and prize competitions rely on competitive structures to drive innovation among participants and usually offer rewards (financial and/or other) to winners and/or finalists. This RFI is not designed to solicit input on DOE's broader water research and development (R&D) efforts.

DATES: Responses to the RFI must be received no later than 5:00pm (ET) on May 14, 2018.

ADDRESSES: Interested parties are to submit comments electronically to WaterPrizeRFI@ee.doe.gov no later than 5:00pm (ET) on May 14, 2018.

FOR FURTHER INFORMATION CONTACT: Questions may be addressed to: Andre de Fontaine, Office of Energy Efficiency & Renewable Energy, 1000 Independence Ave., SW, Washington, DC, 20585. Telephone: (202)-586-6585. Email: andre.defontaine@ee.doe.gov.

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I. Background

Water is a critical resource for human health, economic growth, and agricultural productivity. The United States has benefitted from access to generally low-cost water supplies, but new challenges are emerging that, if left unaddressed, could threaten this paradigm. For example, traditional freshwater sources are coming under stress from competing uses in a growing number of U.S. regions. A range of water quality problems are impacting human health and the environment, while municipal water and wastewater treatment systems face billions of

dollars in unmet infrastructure investment needs, which will likely increase as population grows, and water and wastewater treatment requirements become more stringent.¹ This will put upward pressure on water and sewer rates, which have already experienced steady increases, on a national average, over the last several years.²

Energy is a key resource that modern water systems need to function properly. DOE has conducted substantial work to explore issues and advance solutions related to the energy-water nexus,³ a term used to describe the interconnected nature of energy and water systems. This RFI contains a category of questions that specifically target the energy-water nexus, and energy is a theme that runs through several, if not all, of the other categories. With the exception of the energy-water nexus category, however, respondents should not limit themselves to energy issues in their responses. DOE is interested in collecting broad information that helps define the key water issues that could be addressed through challenges and prize competitions whether they concern energy explicitly, implicitly, or not at all. Responses collected through this RFI may be shared with other agencies to help them craft related prize competitions and challenges.

DOE recognizes that local, state, Federal, private, and non-profit actors are working to address water challenges using a range of mechanisms, including policy changes, early stage R&D, and grant funding. For example, DOE's Advanced Manufacturing Office (AMO) is

¹ Arzbaecher, C., K. Parmenter, R. Ehrhard, and J. Murphy. 2013. *Electricity Use and Management in the Municipal Water Supply and Wastewater Industries*. Palo Alto, CA: Electric Power Research Institute and Water Research Foundation. <http://www.waterrf.org/PublicReportLibrary/4454.pdf>.

² DOE (Department of Energy). 2017. *Water and Wastewater Annual Price Escalation Rates for Selected Cities across the United States*. Washington, DC: DOE. https://www.energy.gov/sites/prod/files/2017/10/f38/water_wastewater_escalation_rate_study.pdf.

³ See, DOE. 2014. *The Water-Energy Nexus: Challenges and Opportunities*. Washington, DC: DOE. <https://energy.gov/sites/prod/files/2014/07/f17/Water%20Energy%20Nexus%20Full%20Report%20July%202014.pdf>.

developing an early stage R&D program to develop technologies that advance the cost-effective and energy efficient production of treated water from a range of conventional and non-conventional sources. AMO has conducted substantial stakeholder engagement to support this early stage R&D effort, including three workshops and a separate RFI issued in June of 2017. This RFI differs from the June request in that it seeks input from the public specifically on the water problems that could be best addressed through challenges and prize competitions. Additionally, it asks how those challenges and prize competitions could be structured to achieve maximum results.

In challenges and prize competitions, a given prize sponsor will define a problem and offer a reward for a solution.⁴ Rewards can be monetary as well as non-monetary, such as national recognition, testing and validation of technologies, access to experts and specialists, and other organizational support. A key characteristic of challenges and prize competitions is they clearly define a problem without prescribing a particular solution path. Participation in prize competitions is generally open to a wide range of participants, with financial or other rewards provided at the end of the competition after a designated target or goal has been reached. This contrasts with traditional R&D funding in which participants are selected up front with funding provided at the beginning in order to pursue a target or goal. Prizes and competitions tend to work best when targeting solutions that are measurable and achievable within a relatively short time period—typically between two and ten years.⁵ Challenges and prize competitions are not limited to technology and technical solutions; they can also promote business models, financing

⁴ For an overview of challenges and prize competitions, see Hendrix, M. 2014. *The Power of Prizes: Incentivizing Radical Innovation*. Washington, DC: U.S. Chamber of Commerce Foundation.

⁵ National Research Council. 2007. *Innovation Inducement Prizes at the National Science Foundation*. Washington, DC: National Academy Press, 2007.

approaches, market design, information systems, policy design, and other innovative solutions.

Among the benefits of challenges and prize competitions are they:

- Reach beyond the “usual suspects” to increase the number of solvers tackling a problem;
- Identify novel approaches;
- Bring out-of-discipline perspectives to bear;
- Establish an ambitious goal without having to predict which team or approach is most likely to succeed; and
- Maximize return on investment by paying only for success.⁶

Since 2010, the Federal government has launched more than 740 challenges and prize competitions with millions of dollars in prize money and other incentives⁷ (foundations, non-profit organizations, and private companies have launched many more). Examples of Federal prizes can be viewed on Challenge.gov. In recent years, DOE has run several prize competitions, including: the Catalyst Energy Innovation Prize (<https://energy.gov/eere/solar/sunshot-catalyst-energy-innovation-prize>), which offered cash prizes to teams and individuals that developed data, analysis, and software solutions that serve the energy efficiency and renewable energy market; and the Clean Tech University Prize (<https://energy.gov/eere/technology-to-market/cleantech-university-prize-cleantech>), which offered entrepreneurial support and financial rewards to teams of university students to support the commercialization of clean energy technologies; and the Wave Energy Prize (<https://waveenergyprize.org/>), which was a

⁶ OSTP (Office of Science and Technology Policy). 2016. *Implementation of Federal Prize Authority: Fiscal Year 2015 Progress Report, A Report from the Office of Science and Technology Policy In Response to the Requirements of the America COMPETES Reauthorization Act of 2010*. Washington, DC: OSTP.

⁷ “About,” <https://www.challenge.gov/about/>, retrieved February 22, 2018.

multi-stage prototype competition incentivizing innovation in wave energy conversion technologies.

II. Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on the key water problems that can be best addressed through challenges and prize competitions. DOE is specifically interested in information on how challenges and prize competitions can be used to engage a broad collection of stakeholders in removing barriers and enabling access to long-term, abundant supplies of low-cost, water. This is solely a request for information and not an announcement of a prize, challenge or competition, nor a Funding Opportunity Announcement (FOA).

III. Request for Information Categories and Questions

Category 1: Increasing Alternative Water Supplies

Traditional freshwater supplies are under stress in several parts of the country with withdrawals either already outpacing supplies or approaching that point. This will become a bigger problem over time as population grows and growth patterns shift. As a result, demand is expected to increase for non-traditional sources of water, which include sea water along coastal regions, brackish water available in much of the heartland, produced waters associated with oil and gas recovery, and beneficial reuse of wastewater treatment effluents. Technologies exist to treat these non-traditional sources of water, though often at high expense.

1. What are the key technical and non-technical challenges that, if overcome, would allow for a significant increase in the volume of available water produced from non-traditional sources? (This can be for a range of beneficial uses, including agricultural, industrial, or drinking purposes.) Please limit responses to those technical and non-technical challenges that could be best addressed through prize competitions.
2. Please elaborate on these challenges by providing: (1) a brief description of the challenge; (2) solutions that could be used to overcome the challenge; and (3) near-term goals that, if met, would signal success in, or significant progress toward, overcoming the challenge.
3. What types of prize incentives or other competitive structures could be employed to drive solutions to these challenges?
4. To what extent do insufficient information, data availability, and monitoring capabilities impede the utilization of non-traditional water sources? Please explain how.

Category 2: Reducing Costs to Treat Drinking Water and Wastewater

DOE's Pacific Northwest National Laboratory estimates that water prices increased each year, on average, by about 4.1% for drinking water and 3.3% for wastewater covering the time period 2008 through 2016. Price increases generally come about as water utilities pay back capital investments to modernize their infrastructure, add capacity, meet new water quality regulatory limits, or some combination of all three. Additional, significant capital expenses for these purposes are expected to persist into the future, leading to continued upward pressure on water prices.

1. What are the key technical and non-technical challenges that, if overcome, could reduce the cost to treat and deliver drinking water and wastewater to consumers, without negative impact on water quality? Please limit responses to those technical and non-technical challenges that could be best addressed through prize competitions.
2. Please elaborate on these challenges by: (1) providing a brief description of the challenge; (2) solutions that could be used to overcome the challenge; and (3) near-term goals that, if met, would signal success in, or significant progress toward, overcoming the challenge.
3. What novel opportunities exist for wastewater treatment plant operators to create revenue streams from resources recovered from their influent? What barriers prevent operators from capturing these opportunities?
4. Are there water quality solutions that, if deployed, could protect water quality more cost-effectively than central treatment systems alone? What are the barriers to deploying these solutions?
5. What types of prize incentives or other competitive structures could be employed to drive solutions to these challenges?
6. To what extent do insufficient information, data availability, and monitoring capabilities impede addressing challenges in the water and wastewater treatment sectors? Please explain how.

Category 3: Opportunities to Use Water More Efficiently

Using water more efficiently can relieve pressure on freshwater sources, save energy, cut costs, and improve water quality. There are opportunities for the commercial and industrial sectors to use water more efficiently, though DOE recognizes that approaches to do so will vary by sector—commercial, residential, industrial, oil and gas, electric power, or agricultural.

Respondents should note which sector(s) they are referring to in any sector specific responses.

1. What are the key technical and non-technical challenges that, if overcome, could lead to significant improvements in water efficiency? Please limit responses to those technical and non-technical challenges that could be best addressed through prize competitions.
2. Please elaborate on these challenges by: (1) providing a brief description of the challenge; (2) solutions that could be used to overcome the challenge; and (3) near-term goals that, if met, would signal success in, or significant progress toward, overcoming the challenge.
3. To what extent do insufficient information, data availability, and monitoring capabilities impede water conservation efforts? Please explain how.
4. Do emerging water utility business models with revenue structures that encourage conservation hold promise for reducing water consumption? What are some of these business models?
5. Given a ten-year timeframe, what are ambitious but achievable water efficiency targets for certain industrial and/or power sector applications? What are those applications?

What are the technical and economic barriers to improving water efficiency within those applications?

6. For any of the questions raised above, what types of prize incentives or other competitive structures could be deployed to drive the development of solutions to these issues?

Category 4: Market-based Solutions that Incentivize Innovation and Conservation

Water utilities across the United States employ a variety of different rate structures.

While water can be scarce or abundant in different parts of the country, water prices often do not reflect these supply and demand conditions. The manner in which water rights are allocated can also have an impact on how water is used. Additionally, end-use customers may not always be aware of the full cost of their water consumption, including the energy needed to pump and heat the water within their homes, buildings, and plants.

1. Do water markets and water rates currently relay appropriate price signals based on supply and demand? If the answer is no, please describe the mechanisms that distort the price signal.
2. Are there market failures or government failures in water markets that, if addressed, could result in water market pricing that more closely reflects supply and demand? Please describe those failures. What are the barriers to achieving more efficient water markets?
3. What challenges related to water pricing or other market design could be best addressed through the use of prizes or competitions?

4. What types of prize incentives or competitive structures could be deployed to drive meaningful solutions to these problems on a near-term basis?

Category 5: The Energy-Water Nexus

The energy-water nexus is a term used to describe the interconnected nature of energy and water systems. For example, energy is required to extract, convey, and deliver water of appropriate quality for diverse human uses and then again to treat wastewater prior to return to the environment. Conversely, water is used in multiple phases of energy production and electricity generation, from hydraulic fracturing and irrigating crops for biofuels to providing cooling water for thermoelectric power plants. Vulnerabilities in one system can affect the other. DOE recognizes that the energy-water nexus theme cuts across the other categories of questions listed above. This category is intended to solicit input on water challenges solely or predominantly impacted by energy issues and energy challenges solely or predominantly impacted by water issues. For questions 1-4, please limit responses to those technical and non-technical challenges that could be best addressed through prize competitions.

1. What are the most critical energy issues that, if solved, could have a measurable and significant near-term impact on the availability of low-cost water supplies?
2. What are the most critical water issues that, if solved, could have a measurable and significant near term impact on low-cost energy production?
3. What opportunities are there to pursue measurable value through integrated energy and water systems?

4. What opportunities are there to pursue measurable value through innovation in water, electricity, and other market design?
5. Please elaborate on the challenges identified in questions 1 through 4 by: (1) providing a brief description of the challenge; (2) solutions that could be used to overcome the challenge; and (3) near-term goals that, if met, would signal success in, or significant progress toward, overcoming the challenge.
6. What types of prize incentives or other competitive structures could be employed to drive solutions to these challenges?

Category 6: Past, Existing, and Forthcoming Water-Related Challenges and Prize Competitions

DOE would like to be aware of any past, existing, or forthcoming water-related challenges and prize competitions to: learn from others' experiences; potentially partner with synergistic initiatives; and/or avoid duplication of effort.

1. Please list any past, existing, or forthcoming water-related challenges and prize competitions. Include brief descriptions of the initiatives and web links if available.
2. What have been some key characteristics of prior successful water or energy-water nexus prize competitions and challenges? Please include examples of incentives that have been effective in prize competitions and challenges.
3. Are there any considerations that DOE should keep in mind when formulating new challenges or prize competitions focused on key water issues?

Category 7: Other Water Challenges not Covered Elsewhere in this RFI

DOE is interested in understanding the broad range of critical water problems that challenges and prize competitions are best suited to tackle. The preceding categories may not be inclusive of all key water challenges facing the country and world. This category of questions is designed to gather input on any other water challenges not covered elsewhere in the RFI.

1. Please include additional challenges not covered previously. What are the technical and non-technical barriers that need to be overcome to solve these problems?
2. How could a challenge or prize competition be structured to address these problems?

IV. Request for Information Response Guidelines

DOE invites all interested parties to submit responses electronically to WaterPrizeRFI@ee.doe.gov no later than 5:00pm (ET) on May 14, 2018. 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 no more than 5 pages in length per category of questions, 12 point font, 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. Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name;

- Company / institution contact;
- Contact's address, phone number, and e-mail address.

Confidential Business Information

Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well marked copies: One copy of the document marked “confidential” including all the information believed to be confidential, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) A description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person that would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

Issued in Washington, DC on March 12, 2018.

Daniel Simmons,

Principal Deputy Assistant Secretary,

Office of Energy Efficiency & Renewable Energy.

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