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DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

[RR08100000, 17XR0680A1, RY.1541CH20.60WA161]

Announcement of Requirements and Registration for a Prize Competition Titled: *More Water Less Concentrate– Stage 1.*

AGENCY: Bureau of Reclamation, Interior.

ACTION: Notice.

SUMMARY: This Challenge seeks to identify innovative solutions to expand usable water supplies by maximizing fresh water production from inland desalination systems in a cost effective and environmentally sound manner. Currently, significant and desirable water supplies are trapped in concentrate streams that are a byproduct of desalination technologies. The cost to manage or dispose of concentrate is rather large and very limiting to utilization of desalination in inland applications. This is Stage 1 of a planned three-stage Challenge, with the second and third stages consisting of prototype demonstrations in lab and field settings and larger prize purses.

DATES: Listed below are the specific dates pertaining to this prize competition:

1. Submission period begins on [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].
2. Submission period ends on [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].
3. Judging period ends on [INSERT DATE 150 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

4. Winners announced by [INSERT DATE 170 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: The *More Water Less Concentrate – Stage 1* Prize Competition will be posted on the following crowd-sourcing platforms where Solvers can register for this prize competition:

1. The Water Pavilion located at the InnoCentive Challenge Center: https://www.innocentive.com/ar/challenge/browse.

2. U.S. Federal Government Challenge Platform: www.Challenge.gov.

InnoCentive, Inc. is administering this challenge under a challenge support services contract with the Bureau of Reclamation. Challenge.gov will re-direct the Solver community to the InnoCentive Challenge Center as the administrator for this prize competition. Additional details for this prize competition, including background information, figures, and the Challenge Agreement specific for this prize competition, can be accessed through either of these prize competition web addresses. The Challenge Agreement contains more details of the prize competition rules and terms that Solvers must agree with to be eligible to compete.

FOR FURTHER INFORMATION CONTACT: Challenge Manager: Dr. David Raff, Science Advisor, Bureau of Reclamation, (202) 513-0516, draff@usbr.gov; Andrew Tiffenbach, (303) 445-2393, atiffenbach@usbr.gov.

SUPPLEMENTARY INFORMATION: The Bureau of Reclamation (Reclamation) is announcing the following prize competition in compliance with 15 U.S.C. 3719, Prize Competitions.

PRIZE COMPETITION SUMMARY: In many areas, particularly in the Western

United States, existing sources of fresh water are fully or over-allocated. When inland communities are evaluating potential sources for a new water supply, desalination is often overlooked or not considered due to its perceived high cost. A major contributing factor to the cost is the additional handling and/or treatment required to manage concentrate streams where significant and desirable additional water resources are also lost.

Desalination processes, typically membrane or thermal based processes, produce a concentrate stream composed primarily of the salts in the feed and some of the initial feed water. The cost to manage or dispose of concentrate streams is often prohibitive for inland brackish desalination and is currently a limiting factor to more widespread utilization of desalination in inland applications. This challenge is seeking solutions to minimizing the concentrate stream volume and associated handling costs while maximizing the useable water produced by the process.

Desalination process recovery is often limited by capital and operational treatment costs. Saturation levels of sparingly soluble species such as calcium sulfate ($CaSO_4$), calcium carbonate ($CaCO_3$), and silica (SiO_2) are reached in desalination processes as the saltwater feed is processed to fresh water leaving behind a highly saturated stream referred to as concentrate. Thus, classes of solutions to the concentrate problem might increase the quantity of treated water recovered from desalination processes without incurring issues with sparingly soluble species, therefore decreasing the volume of concentrate generated and increasing the overall system recovery. Other solutions may include novel desalination technologies or improvements to existing technologies that will increase the overall system recovery of desalination processes while also overcoming

other operational and cost hurdles. Another class of solutions to the concentrate problem is to post-treat the concentrate stream that is produced to reduce its concentrate volume or to produce a solid waste product; thereby reducing the volume requiring disposal.

In this prize competition, the Bureau of Reclamation is seeking innovative solutions to increase the amount of usable water supplies in an affordable, environmentally sustainable, and efficient manner to make desalination more accessible to communities looking to expand water supplies. Solutions can be novel technologies or approaches that build upon existing technologies and approaches for the production of fresh water from saline sources that increase the overall system recovery beyond the level of what is currently achieved. Solutions can include ideas to reduce the large concentrate volumes by treatment of the concentrate or by selectively removing less soluble species from either the feed water, concentrate streams or at any other part of the desalination system. Other ideas to control or inhibit scale formation due to sparingly soluble species are also being sought along with any new technologies or improvements to existing technologies that increase the overall system recovery of a desalination system.

This Challenge consists of three stages:

- Stage 1 is a Theoretical Challenge requiring a white paper submittal. Participants are asked to submit an idea, such as a process or equipment design, along with anticipated impact (if successful), detailed descriptions, specifications, supporting data or literature, and requirements necessary to bring the idea to practice. Stage 1 may award up to 6 prizes from a total prize award pool of $150,000.

- If Stage 1 proves successful, Stage 2 is planned as a subsequent Reduction-to-Practice Challenge to demonstrate proof-of-concept data at the bench scale. Stage 2

envisions a total prize pool of $450,000 or more, and awarding up to 3 prizes.

- Stage 3 is envisioned as a Grand Challenge, Reduction-to-Practice demonstration at pilot-scale in a field-test setting. Stage 3 envisions a total prize pool of $500,000 or more, and awarding up to 2 prizes.

In addition to the direct monetary awards for Stages 2 and 3, Reclamation will invite industry, non-profit organizations, and venture capital representatives to be present at the Stages 2 and 3 presentations and testing. Participating industry and venture capital representatives will also have the ability to seek and secure potential business deals with Solvers.

This posting only launches the Stage 1 competition. However, information on the envisioned framework and prizes for Stages 2 and 3 are available here: http://www.usbr.gov/research/challenges/current/index.html. Subsequent stages will be officially launched and announced with a separate Challenge.gov posting and a separate Federal Register Notice.

Stage 1 is a Theoretical Challenge that requires only a written proposal to be submitted. The Challenge award will be contingent upon critical analysis and evaluation by the Seeker (Reclamation) and the judging panel appointed by the Seeker. The Seeker has a total prize pool budget of $150,000 to pay the top six submission(s) that meet or exceed the criteria below an award of at least $25,000 each. No awards are guaranteed unless they meet or exceed the criteria, and more than one award is not guaranteed. Full or partial awards will be considered for solutions that meet all or some of the criteria, respectively. If only a single submission meets or exceeds the criteria, the prize award may be as high as $50,000.

To receive an award, the Solvers will not have to transfer their intellectual property rights to the Seeker and will not have to grant the Seekers a non-exclusive license to practice their solutions. Please note that any proposal submitted will not be treated as confidential information. Accordingly, Solvers should take whatever steps they deem necessary to protect their proprietary rights in their solutions prior to submitting their written proposal for consideration in the Challenge (e.g. filing provisional or full patent applications on the solution described in the written proposal submitted prior to submission).

Technical Requirements. The goal of this Challenge is to identify methods to increase the overall system recovery in a cost effective and environmentally safe manner to reduce large volumes of concentrate that requires disposal and to increase usable water supplies. Overall system recovery is defined as the total product water divided by the total feed water. This challenge is seeking solutions to minimizing the concentrate stream while maximizing the useable water produced by the process.

One class of solutions to the concentrate problem is to increase the quantity of treated water recovered from desalination processes, which, a priori, decreases the volume of concentrate generated. Desalination process recovery is often limited when saturation levels of sparingly soluble species (e.g. $CaSO_4$, $CaCO_3$, SiO_2) are reached in the process when fresh water is generated from the desalination process and volume of feed water decreases. Another class of solutions to the concentrate problem is to treat the concentrate stream that is produced to reduce its volume or to produce a solid waste product; thereby reducing the volume requiring disposal. Other solutions can include novel desalination technologies with higher overall system recovery than conventional

desalination technologies.

Three sample water qualities from different inland brackish desalination locations with the various recoveries that each plant is currently able to achieve are provided in the challenge posting available through web addresses included under the Addresses section of this Federal Register Notice.

Things to Avoid

The Seeker is not interested in the following:

1. Surface and sewer discharge solutions.
2. Known evaporation pond solutions (improvements could be acceptable).
3. Deep well injection solutions.
4. Existing technologies without any improvements to reduce concentrate volume, reduce cost or operational complexity, etc. of the existing desalination technology, i.e. reverse osmosis (RO), thermal or other membrane separation. The Seeker is not looking for a review of all known techniques so this requires something new/novel in your solution.

The judging panel will evaluate each proposed solution against the following Solution Requirements:

Must Have:

1. Increase in overall system recovery: Solution must explain how the approach can increase overall system recovery on one of the three water samples provided in Table 1 for a plant producing at least 1 million gallons of drinking water quality per day. Solution must be capable of treating large volumes of at least 1 million gallons per day. Typical desalination systems generate large volumes of concentrate per day that require

further treatment and/or handling.

2. Cost effective: Solutions are sought that can improve the recovery and reduce concentrate volume in a cost effective manner. Solutions cannot significantly increase life cycle (i.e. capital, operating, and maintenance) costs of systems.

3. Environmentally friendly: Solutions should not create additional waste (in volume and complexity) than what exists today. The solution needs to be environmentally friendly and not create more problems than what is being solved. Thus, the solution must provide an assessment of life-cycle impacts relative to existing inland desalination approaches.

Nice to have (not as important as the requirements above, but would add value to a submission):

1. Solution demonstrates an increase in Overall System Recovery on two or more of the three water samples provided in Table 1 producing a minimum of 1 million gallons per day of drinking water quality.

2. Submissions that meet the requirements will also be judged on the following items:

- Feasibility (technical/scientific, economic and environmental life-cycle considerations).
- Flexibility to changing water quality.
- Energy efficiency.
- Scalability.

PROJECT DELIVERABLES: This Theoretical Challenge requires a written proposed

solution which describes novel new technologies or improvements to existing technologies to increase overall system recovery and decrease the volume of concentrate. Each submission should include:

1. A one-paragraph executive summary of the proposed solution. All Solvers agree to allow the executive summaries of their solutions to be posted on Reclamation's web-page and used in other publications reporting the results of this Challenge.

2. Idea description that should include:

a. Detailed description of a method to increase overall system recovery and decrease the volume of concentrate. The Solver must describe with a high level of technical detail as to how the system would meet or not meet each of the "must have" and "nice to have" Solution Requirements described above. The Solver should expect that their submittal will be reviewed by experts in the field of water treatment, chemistry, and multiple fields of engineering. If the level of detail is insufficient for the experts, it can't be scored as feasible.

b. Rationale as to why the Solver believes that the proposed method will work. This rationale should address each of the Solution Requirements and should be supported with relevant examples/data.

c. Drawings/sketches of the proposed system, if applicable.

The proposal <u>should not</u> include any personal identifying information (name, username, company, address, phone, email, personal website, resume, *etc*.)

JUDGING: After the Challenge submission deadline, a Judging Panel will evaluate the submissions and make a decision with regards to the winning solution(s). The Judging Panel may be composed of Federal and/or Non Federal scientists, engineers, and other

technical experts, including subject matter experts from the listed collaborators for this Challenge. All Solvers that submit a proposal will be notified on the status of their submissions. Decisions by the Seeker cannot be contested.

ELIGIBILITY RULES: To be able to win a prize under this competition, an individual or entity must:

1. Agree to the rules of the competition (15 U.S.C. 3719(g)(1));

2. Be an entity that is incorporated in and maintains a primary place of business in the United States, or (b) in the case of an individual, a citizen or permanent resident of the United States (15 U.S.C. § 3719(g)(3)).

However, submissions can be entertained from all Solvers regardless of whether they are U.S. citizens/entities. Meritorious submissions from non-eligible persons and entities, if any, will be recognized in publications issued by the Seeker announcing the results of the competition, such as press releases. Non-U.S citizens/permanent residents or non-U.S entities can also be included on U.S. teams. However, prizes — whether monetary or otherwise — will only be awarded to eligible persons and entities under the authority of the America COMPETES Reauthorization Act of 2010 (15 U.S.C. § 3719).

3. Not be a Federal entity or Federal employee acting within the scope of their employment (15 U.S.C. § 3719(g)(4)). A Federal entity is defined by 5 U.S.C. Appendix 8G with a list of current Federal entities periodically posted on the Federal Register.

4. Assume risks and waive claims against the Federal Government and its related entities (15 U.S.C. § 3719(i)(1)(B)); and,

5. Not use Federal facilities, or consult with Federal employees during the competition unless the facilities and employees are made available to all individuals and

entities participating in the competition on an equitable basis.

The following individuals or entities are not eligible regardless of whether they meet the criteria set forth above:

1. Any individual or organization who employs an evaluator on the Judging Panel or otherwise has a material business relationship or affiliation with any Judge.

2. Any individual who is a member of any Judge's immediate family or household.

3. The Seeker, participating organizations, and any advertising agency, contractor or other individual or organization involved with the design, production, promotion, execution, or distribution of the prize competition; and all employees, and all members of the immediate family or household of any such individual or organization.

4. Any individual or entity that uses Federal funds to develop the proposed solution now or any time in the past, unless such use is consistent with the grant award, or other applicable Federal funds awarding document. NOTE: Individuals or entities that have been funded by the Federal Government in the past to work within the technical domain of the competition are eligible provided their specific submission was not developed by them with Federal funds. Submissions that propose to improve or adapt existing federally funded technologies for the solution sought in this prize competition are also eligible. Individuals are also encouraged to consult with their employer Ethics Officer for additional guidance and considerations.

CONSULTATION: Reclamation and collaborator scientists, engineers, and technical specialists were consulted in identifying and selecting the topic of this prize competition. Direct and indirect input from various stakeholders and partners were also considered. The U.S. Environmental Protection Agency, the U.S. Army, U.S Army Corps of

Engineers, the Water Environment and Reuse Foundation, and the Water Research Foundation are collaborating with Reclamation on various aspects of this Challenge.

PUBLIC DISCLOSURE: InnoCentive, Inc. is administering this challenge under a challenge support services contract with Reclamation. Participation is conditioned on providing the data required on InnoCentive's online registration form. Personal data will be processed in accordance with InnoCentive's Privacy Policy which can be located at *http://www.innocentive.com/privacy.php.* Before including your address, phone number, e-mail address, or other personal identifying information in your proposal, you should be aware that the Seeker is under no obligation to withhold such information from public disclosure, and it may be made publicly available at any time. Neither InnoCentive nor the Seeker is responsible for human error, theft, destruction, or damage to proposed solutions, or other factors beyond its reasonable control.

LIABILITY AND INDEMNIFICATION: By participating in this Challenge, each Solver agrees to assume any and all risks and waive claims against the federal government and its related entities, except in the case of willful misconduct, for any injury, death, damage, or loss of property, revenue, or profits, whether direct, indirect, or consequential, arising from participation in this Challenge, whether the injury, death, damage, or loss arises through negligence or otherwise. By participating in this Challenge, each Solver agrees to indemnify the federal government against third party claims for damages arising from or related to Challenge activities.

NO INSURANCE REQUIRED: Based on the subject matter of the Challenge, the type of work that it will possibly require, as well as an analysis of the likelihood of any claims for death, bodily injury, or property damage, or loss potentially resulting from

competition participation, Solvers are not required to obtain liability insurance or demonstrate financial responsibility in order to participate in this Challenge.

Dated: November 18, 2016.

David Raff,
Science Advisor

[FR Doc. 2016-29723 Filed: 12/12/2016 8:45 am; Publication Date: 12/13/2016]