PMC-ND
(1.08.09.13)

U.S. DEPARTMENT OF ENERGY
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY
NEPA DETERMINATION

RECIPIENT: University of Illinois at Urbana-Champaign **STATE:** IL

PROJECT TITLE: Ultra compact and efficient heat exchanger for solar desalination with unprecedented scaling resistance

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001778	DE-EE0008392	GFO-0008392-001	

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:

Description:

A9 Information gathering, analysis, and dissemination	Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)
B3.6 Small-scale research and development, laboratory operations, and pilot projects	Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to University of Illinois at Urbana-Champaign (University of Illinois) to design, develop, and test novel heat exchanger technology with improved performance efficiency and fouling/scaling resistance, as compared to current heat exchanger technologies. The project would include the fabrication of prototype heat exchangers via additive manufacturing techniques, which would be tested in-lab for thermal performance at the 5 kW and 20 kW scales. Heat exchanger prototypes would also be field tested in order to assess long-term performance.

The project would be completed over three Budget Periods (BPs), with a Go/No-Go decision in between each period. This NEPA review applies to all three BPs, with the exception of Task 11, under BP3, which would consist of field deployment of a pilot heat exchanger. A location has not yet been identified for field deployment. Other facets of this task would depend on the results of to-be-completed laboratory work. Because sufficient information is not yet available, a NEPA review for Task 11 will be completed at a later date.

Project activities proposed for BP1 would include the development of heat exchanger design criteria, computer modelling, materials analysis and characterization, development of manufacturing processes and optimization tools, and techno-economic analysis of additive manufacturing. Proposed activities for BP2 would include surface materials development, anti-fouling performance analysis/testing (under laboratory conditions mimicking desalination) and fabrication of heat exchanger surfaces (using additive manufacturing or laser ablation). Proposed activities for BP3 would include durability analysis, design, fabrication and laboratory testing of prototype heat exchangers, and preparation of a commercialization plan. As noted above, this budget period would also include field deployment (Task 11), which cannot be reviewed at this time.

All in-laboratory testing would be performed by University of Illinois on the University's main campus in Urbana, IL. Materials/equipment to be used for project activities would include conventional heat transfer equipment (e.g. electric heaters, heat exchangers, pumps, fans, valves, etc.) and working fluids including salt water and ethylene-

glycol/water mixtures. Fabrication of components and materials would be completed primarily at Oak Ridge National Laboratory ('ORNL' – Oak Ridge, TN), with some additional fabrication of polymers and metal parts at University of Illinois. Fabrication processes would include the production of manifolds/shells via conventional methods, heat transfer surfaces via cleanroom/lithographic methods and additive manufacturing methods, and single tubes via additive manufacturing methods. All materials would be handled in accordance with each entity's health and safety policies and procedures. These include monitoring and oversight, health and safety training for all laboratory personnel, and the use of proper protective equipment. All project activities would occur in-lab, at existing, dedicated facilities in accordance with federal, state, and local environmental regulations.

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

Based on the review of the proposal, DOE has determined that all BP1 and BP2 Tasks; and BP3 Tasks 9, 10 and 12 fit within the class of action(s) and the integral elements of Appendix B to Subpart D of 10 CFR 1021 outlined in the DOE categorical exclusion(s) selected above. DOE has also determined that: (1) there are no extraordinary circumstances (as defined by 10 CFR 1021.410(2)) related to the proposal that may affect the significance of the environmental effects of the proposal; (2) the proposal has not been segmented to meet the definition of a categorical exclusion; and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. All BP1 and BP2 Tasks; and BP3 Tasks 9, 10 and 12 are categorically excluded from further NEPA review.

NEPA PROVISION

DOE has made a conditional NEPA determination for this award, and funding for certain tasks under this award is contingent upon the final NEPA determination.

Insert the following language in the award:

You are restricted from taking any action using federal funds, which would have an adverse affect on the environment or limit the choice of reasonable alternatives prior to DOE/NNSA providing either a NEPA clearance or a final NEPA decision regarding the project.

Prohibited actions include:
Budget Period 3, Task 11: Field Deployment
This restriction does not preclude you from:
All Budget Period 1 and 2 Tasks
Budget Period 3, Task 9: Durability Analysis and Compatibility to AM Process
Budget Period 3, Tasks 10.1, 10.2, and 10.3: Design, Fabrication, Testing, and Validation of Prototype Heat Exchanger
Budget Period 3, Task 12: Commercialization Plan
If you move forward with activities that are not authorized for federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share.

Insert the following language in the award:

You are required to:
Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

Note to Specialist :

Solar Energy Technologies Office
This NEPA determination requires a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 08/20/2018

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature:  Electronically Signed By: Kristin Kerwin Date: 8/21/2018

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____
Field Office Manager