

PMC-ND  
(1.08.09.13)

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

**RECIPIENT:** General Electric Company, GE Research**STATE:** NY**PROJECT TITLE:** Additively Manufactured sCO<sub>2</sub> Power Cycle Heat Exchangers for CSP

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0001840	DE-EE0008737	GFO-0008737-001	GO8737

**Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Policy 451.1), 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 federal funding to the General Electric Company (GE Research) to develop manufacturing processes and heat exchanger core designs that enable low-cost high temperature recuperators (HTR) for Concentrated Solar Power (CSP) supercritical carbon dioxide (sCO<sub>2</sub>) power cycles.

Activities associated with the proposed project would include the design, fabrication, and testing of Binderjet (3D printer for industrial materials) additively manufactured HTRs, alongside process development and cost modeling to assess the feasibility of design scale-up for commercial manufacturing. Technical scope of work would be limited to data analysis, computer modeling, preliminary design/engineering, and laboratory research. Design and analysis of HTRs, process development for the manufacturing of stainless-steel heat exchanger features and heat exchangers (including fabricating the object in a Binderjet manufacturing machine), and validation testing (heat transfer, pressure drop, and burst testing) would all occur at the dedicated GE Research Center in Niskayuna, NY. Cost modeling would occur at the GE Additive facility in West Chester, OH.

No change in the use, mission or operation of GE's existing facilities would arise out of this effort. The GE Research Center has all applicable permits in place, and would not need additional permits for the proposed activities. All equipment to be used is GE-owned, already in place, and would continue to be used after the conclusion of the proposed project. The proposed project does not involve new equipment installations or modifications of existing research facilities.

The proposed project would involve the operation of equipment to achieve high temperature and pressure conditions, as well as the use of potentially hazardous liquids and/or gases. All such testing would be properly contained within an enclosure specifically designed to withstand, minimize, and/or contain the energy released, such as a hydraulic pressure chamber and flow laboratory. GE's existing environmental, health, and safety (EHS) policies and procedures would be followed. These include employee training, the use of protective equipment, extensive

safety review, strict adherence to standard operating procedures (SOPs), and the identification of any new hazards during the course of work so as to update written SOPs.

It is estimated that approximately 1000 pounds (lbs) of stainless steel powder would be acquired for the purposes of the proposed project. Of the 1000 lbs, it is estimated that only about 200 lbs of stainless steel powder would be consumed to produce approximately this amount of manufactured materials (some waste metal may be generated). Due to the nature of the Binderjet manufacturing process, the remaining 800 lbs of powder would remain in the powder feed system and eventually be recycled along with any other waste metals produced. Approximately 100 lbs of binder material (glue-like substance) would be used during the sintering process. Excess binder would be properly collected and treated according to its safety data sheet properties, then sent to a GE approved industrial waste facility. All wastes generated at this facility undergo a review by an onsite EHS department and are managed under a process that ensures full compliance with applicable Federal, state, and local regulations. Emissions generated would be relatively minor and covered under an existing Title V permit held by GE.

In addition, it is expected that mechanical material testing for tensile and creep strength would be completed by an external commercial entity. Although the particular vendor and test facility have not yet been selected, this is a common service, and GE Research presently uses several such external commercial material testing entities. A selection would be made during the course of the project. Given that work would be conducted indoors by a qualified 3rd party vendor at an existing, purpose-built facility, no adverse impacts to sensitive resources are expected as a result of the proposed mechanical testing regardless of specific location.

## NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Solar Energy Technologies Office

This NEPA determination does not require a tailored NEPA Provision.

NEPA review completed by Whitney Doss, 08/06/2019

## FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D. To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal.

The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

The proposed action is categorically excluded from further NEPA review.

## SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: \_\_\_\_\_



Casey Strickland

Date: 8/6/2019

NEPA Compliance Officer

**FIELD OFFICE MANAGER DETERMINATION**

- Field Office Manager review not required
- Field Office Manager review required

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

Field Office Manager's Signature: \_\_\_\_\_

Field Office Manager

Date: \_\_\_\_\_