PMC-ND
(1.08.09.13)

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

RECIPIENT: University of California-Davis **STATE:** CA

PROJECT TITLE: Additively-Manufactured Molten salt-to-supercritical carbondioxide Heat Exchanger

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001840	DE-EE0008536	GFO-0008536-001	

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 University of California Davis (UCD) to design, fabricate, and experimentally validate the performance of molten salt-to-supercritical carbon dioxide (sCO2) heat exchangers (HX) for concentrating solar power (CSP) applications using additive manufacturing (AM) of nickel superalloys.

The proposed project would involve research in material science and engineering, advanced manufacturing, cost modeling, and microchannel heat exchanger design. Associated activities would include data analysis, computer modeling, and scale up design conducted in parallel with the characterization of AM superalloy specimens and HX prototypes fabricated throughout the project duration. Experimental results would ultimately be used to validate predictive models for the performance of this technology in a chloride salt environment; the scope of work under this award would not exceed laboratory-based research and development (R&D) and would not involve demonstration of the prototype HX in an operational CSP setting.

The Recipient would conduct heat exchanger performance experiments and temperature/pressure testing at UCD's dedicated Solar Thermal and Energy Enhancement Laboratory (STEEL) located on campus (Davis, CA). Metal Powder Works, LLC (MPW; Austin TX) would process approximately 200 kilograms of nickel alloy powder from a combination of commercially-available stock alloys. Carnegie Mellon University (CMU; Pittsburgh, PA) would utilize the powder produced by MPW in a 3D metal printing process and would also perform microscopy on the powders and printed materials. Small samples of the developed AM superalloys would be sent to the National Renewable Energy Laboratory (NREL; Golden, CO) for corrosion and materials compatibility testing.

Proposed experiments at UCD would involve generating high temperature and high pressure conditions in-lab. The facility was designed and constructed to mitigate attendant risks, and standard operating procedures and best practices are followed at all times to reduce exposure to hazards. Further, all project-related work at UCD would be subject to the review and oversight of multiple university departments to include Fire and Environmental Health and

Safety. At other project locations, the development of AM superalloys would involve the use and handling of fine metal powders and etching/polishing chemicals. The project is not anticipated to require the use of toxic or hazardous materials other than possibly minor quantities of typical laboratory acids and solvents during certain steps in the development process. Personal Protective Equipment (PPE) would be employed to minimize exposure to elemental Nickel, and, where applicable, project personnel would adhere to existing approaches for the special management of metal powders or potentially hazardous chemicals. The project would not generate additional wastes beyond those normally encountered in the routine operations of a materials laboratory. At the conclusion of the proposed project, fabricated equipment components would be retained for future research.

The laboratories in which project work would occur were purpose-built for the types of R&D activities being proposed; therefore, no physical modifications or new permits would be necessary. No change in the use, mission or operation of existing facilities would arise out of this effort. 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.

NEPA PROVISION

DOE has made a final NEPA determination.

Include the following condition in the financial assisstance agreement:

Any work proposed to be conducted at a federal facility may be subject to additional NEPA review by the cognizant federal official and must meet the applicable health and safety requirements of the facility.

Notes:

Solar Energy Technologies Office
This NEPA determination requires a tailored NEPA Provision.
NEPA review completed by Whitney Doss, 3/15/2019

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: Electronically Signed By: Kristin Kerwin Date: 3/15/2019

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

- [x] 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: _____ Date: _____

Field Office Manager