

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



RECIPIENT: University of California Davis

STATE: CA

PROJECT TITLE : Enabling Micro-pin Array Receivers for Power Generation and High-temperature Process Heating Using Metal Additive Manufacturing- Development, Design and De-risk

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002378	DE-EE0010190	GFO-0010190-001	

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.

**B5.15 Small-
scale
renewable
energy
research and
development
and pilot
projects**

Small-scale renewable energy research and development projects and small-scale pilot projects, provided that the projects are located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to the University of California Davis (UCD) to design, fabricate, and test concentrated solar polar (CSP) receiver panels for power generation via supercritical carbon dioxide (sCO₂) systems and process heat applications.

Award activities would be of an iterative nature, centered around designing, fabricating, and testing of materials, components, and panels for three successive generations of receiver panels. Each successive generation of panels would be optimized by integrating findings from other award activities. Design activities would include computer modeling. Fabrication activities would be completed by Carnegie Mellon University (CMU) (Pittsburgh, PA) and Materials Resources, LLC (MRL) (Xenia, OH) using additive manufacturing (AM) technologies and techniques with powdered (e.g. nickel alloy) metals.

Testing activities would include laboratory tests, small-scale on-sun tests, accelerated aging tests, and 150kW-scale on-sun tests. Laboratory tests would characterize materials and components. Such tests would be performed at UCD, CMU, and Utah State University (USU) (Logan, UT). Small-scale on-sun tests for subscale panels would be performed at UCD using their existing solar dish. Accelerated aging tests for surface material samples would be completed by using the high-flux solar simulator at Sandia National Laboratories (SNL) National Solar Thermal Test Facility (NSTTF) (Albuquerque, NM). The 150kW-scale on-sun tests for the third generation panels would be completed at NSTTF. Such tests would include the use of the existing solar tower, heliostat field, and sCO₂ systems.

Approximately 450kg of metallic powder would be used to complete fabrication activities. Approximately 1000kg of carbon dioxide and 520 gallons of propane would be used during testing activities.

All facilities are preexisting purpose-built facilities for the type of work to be conducted for this award. Facility modifications would not be required at any facility. Award activities would involve the handling and use of hazardous materials, including metallic powders, pressurized gases, strong acids, and combustible fuels. All such handling and storage would occur within controlled settings and would follow existing policies and procedures for handling and disposal of these materials. Award activities would involve typical hazards associated with CSP research, additive manufacturing, and engineering laboratories, including extremely high temperatures, high-pressures generated by equipment, lasers, and operation of tools and equipment. Existing university, corporate, and government health, safety, and environmental policies and procedures would be followed at all facilities, including: personnel training, proper personal protective equipment (PPE), engineering controls, monitoring, and internal assessments.

Additional award activities would include those of an intellectual, academic, and analytical nature. Such activities would include cost modeling, surveying potential industrial sites which would benefit from solar process heat, preliminary engineering designs for a potential 5MW test at NSTTF, development of a receiver design optimization (software) tool, and completion of a techno-economic analysis (TEA).

DOE has considered potential impacts on resources, including those of an ecological, historical, cultural, and socioeconomic nature. DOE does not anticipate adverse impacts on these resources.

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.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Solar Energy Technologies Office (SETO)
NEPA review completed by Dan Cahill, 08/22/2022.

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: Lisa Jorgensen

NEPA Compliance Officer

Date: 8/23/2022

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: _____