

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



**RECIPIENT:** [Utah State University](#)

**STATE:** UT

**PROJECT TITLE:** [Modular Design of High Temperature and Pressure Heat Exchangers Using 3D Printing](#)

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
<a href="#">DE-FOA-0002243</a>	<a href="#">DE-EE0009381</a>	<a href="#">GFO-0009381-001</a>	<a href="#">GO9381</a>

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 Utah State University to develop Functionally Graded Material (FGMs) to achieve high-performance, low-cost, high-temperature recuperators for the supercritical carbon dioxide (sCO<sub>2</sub>) Brayton cycle integrated with concentrated solar power (CSP) applications.

Proposed project activities include design, computer modeling, and process development using the latest additive manufacturing (AM) technologies, materials, and characterization methods to support the innovative modular design concept of using dissimilar metals for building monolithic high-temperature heat exchangers. Over the course of the project, a small-scale prototype High Temperature Recuperator (HTR) unit would be fabricated and pressure-tested for sCO<sub>2</sub> Brayton cycles.

Design and modeling as well as mechanical and pressure testing would be conducted at Utah State University (Logan, UT). Additional design work, process development, and fabrication activities would occur at the facilities of subrecipient FormAlloy (Spring Valley, CA and Westfield, IN). All facilities in which project work would occur are designed for this type of research; therefore, no modifications or new permits, additional licenses and/or authorizations would be necessary. No change in the use, mission, or operation of existing facilities would arise out of this effort.

The proposed project would involve the use and handling of bench-scale quantities of various hazardous materials, including metal parts/powders, hydraulic oil and industrial solvents. All such handling would occur in laboratory facilities dedicated to proper hazardous material handling and disposal practices. All hazardous materials would be managed in accordance with federal, state, and local environmental regulations. At the conclusion of the proposed project, the equipment used for development, fabrication, and testing would remain at the respective institutions. Remaining metal powders and fabricated parts would be recycled or kept for future research use.

**NEPA PROVISION**

DOE has made a final NEPA determination.

