PMC-ND
(1.08.09.13)

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

RECIPIENT: University of Connecticut **STATE:** CT

PROJECT TITLE: High Throughput Screening of Ultra-Thin Electrocaloric Materials Enabled by Additive Manufacturing

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001980	DE-EE0009099	GFO-0009099-001	GO9099

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 funding to the University of Connecticut (UConn) to design, develop, and fabricate an electrocaloric (EC) composite film that could serve as an energy efficient replacement in vapor compression cooling. This film would be printed using an electrospray printing technique that allows for fine control of the film thickness and composition. The project would be completed over two Budget Periods (BPs), with a Go/No-Go Decision Point between the two BPs. This NEPA determination applies to both BPs.

Proposed project activities would include machine learning, design, fabrication, and testing. The film composite would be composed of a solid electrocaloric polymer and an encapsulated liquid crystal (LC) resulting in a film that could produce substantial cooling. Material would be screened for processability metrics including spray stability and deposition consistency. The most viable LC, polymer, and solvent combination for the printing process would be selected for further testing. Machine learning would help determine the optimal process, structure, and properties of the film. The resulting EC composite film would be fabricated and evaluated for properties such as thickness, morphology, thermal transitions, and electrocaloric performance. The final composite would serve to establish the relationship of film thickness and LC loading to temperature rise and dielectric strength.

UConn would oversee the project. United Technologies Research Center (UTRC) is a subrecipient. UConn would be responsible for design, fabrication, and characterization of the composite film. UTRC would provide expertise on EC cooling systems and would be responsible for characterizing the EC films made by UConn and using machine learning to streamline the high throughput testing. No facility modifications would be made and no additional permits would be required in order to conduct any of the project activities at either location.

Project activities would involve the use and handling of various materials, including industrial solvents and flammable gases. Any risks associated with the handling of these materials would be mitigated through adherence to environmental health and safety protocols and policies at UConn and at UTRC, including the use of personal protective equipment, fume hoods, and personnel training. Nanoscale materials existing in liquid crystal suspension would be used in the project. Although discrete nanoparticles would not be used, all work involving spray would be performed under a fume hood as an added precaution and in accordance with corporate health and safety policies. All waste products generated at UConn would be disposed of according to the University's comprehensive chemical waste disposal system.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Advanced Manufacturing Office
This NEPA determination does not require a tailored NEPA provision.
Review completed by Shaina Aguilar on 7/24/20.

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: Casey Strickland Date: 7/29/2020
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