PMC-ND
(1.08.09.13)

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

RECIPIENT: Trustees of the University of Pennsylvania **STATE:** PA

PROJECT TITLE: High Efficiency Waste Heat Harvesting Using Novel Thermal Oscillators

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001465	DE-EE0008314	GFO-0008314-001	GO8314

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), 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.
B3.15 Small-scale indoor research and development projects using nanoscale materials	Siting, construction, modification, operation, and decommissioning of facilities for indoor small-scale research and development projects and small-scale pilot projects using nanoscale materials in accordance with applicable requirements (such as engineering, worker safety, procedural, and administrative regulations) necessary to ensure the containment of any hazardous materials. Construction and modification activities would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible).

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to University of Pennsylvania to develop and demonstrate thermal oscillators capable of generating electricity from waste heat through pyroelectric harvesting. The thermal oscillators would be engineered using polymer and polymer nanocomposite materials, which would be tested over the course of the project.

Proposed project activities would include data analysis and computer modeling (heat flow, temperature change and energy dynamics simulations), materials testing and characterization, monomer/polymer synthesis, thermal switch temperature customization, fabrication of shape memory elements, pyroelectric device assembly and testing, and the development of a roll-to-roll workflow for device fabrication. Materials testing would involve measurements of thermophysical properties, particularly changes in thermal conductivity as a function of temperature. Shape memory polymers would be synthesized for use as an electrohydrodynamic thermal switch.

The proposed project would include the handling of hazardous materials, chemical reagents (monomers, nanoparticles and silicone oils) to be used for the preparation of polymer/plastic films and thermal fluids. All handling would occur in laboratory settings and would pose no risk to the public. Nanomaterials, including boron nitride and silica nanoparticles, would be used as fillers to create thermal fluids. The nanomaterials would be chemically inert, but could pose an inhalation risk. Accordingly, University of Pennsylvania, Yale University, and Rutgers would adopt

procedures for the safe handling and disposal of nanomaterials based on each institution's safety, training and hazardous waste protocols. These procedures would include the use of protective equipment (e.g. respiration masks, protective eyewear, gloves, and lab coats) and fume hoods or local extractors to provide ventilation in the workspace. Disposal of unused nanomaterials or fluid suspensions containing nanomaterials would be performed using sealed hazardous waste containers that would be labelled and picked up by an authorized hazardous waste disposal contractor.

All project activities would be carried out at existing, purpose-built research laboratories owned and operated by University of Pennsylvania, in Philadelphia, Pennsylvania, Yale University, in New Haven, Connecticut, and Rutgers University, in Piscataway, New Jersey. All facilities would comply with established procedures for work in laboratory settings, including the safe disposal of hazardous materials and personnel training, as well as all applicable Federal, State, and local environmental regulations. No change in the use, mission, or operation of existing facilities would arise out of these efforts. No new permits, licenses, or authorizations would need to be obtained by any of the institutions to carry out the activities contemplated as part of this project, nor would existing permits, license, or authorizations need to be modified.

Based on the review of the proposal, DOE has determined the proposal fits within the class of action(s) and the integral elements of Appendix B to Subpart D of 10 CFR 1021 outlined in the DOE categorical exclusion(s) selected above. DOE has also determined that: (1) there are no extraordinary circumstances (as defined by 10 CFR 1021.410(2)) related to the proposal that may affect the significance of the environmental effects of the proposal; (2) the proposal has not been segmented to meet the definition of a categorical exclusion; and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. This proposal is categorically excluded from further NEPA review.

NEPA PROVISION

DOE has made a final NEPA determination for this award

Insert the following language in the award:

If the Recipient intends to make changes to the scope or objective of this project, the Recipient is required to contact the Project Officer, identified in Block 15 of the Assistance Agreement before proceeding. The Recipient must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved. If the Recipient moves forward with activities that are not authorized for Federal funding by the DOE Contracting Officer in advance of a final NEPA decision, the Recipient is doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share.

Note to Specialist :

Advanced Manufacturing Office
This NEPA Determination does not require a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 8/2/2018

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By: Casey Strickland Date: 8/2/2018

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

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

Field Office Manager's Signature: _____ Date: _____

Field Office Manager