

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



RECIPIENT: General Electric Company (dba) GE Additive

STATE: OH

PROJECT TITLE : Additive Manufacturing of High Resolution SiC Fiber Composite Components for Utilization in Energy Systems

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002553	DE-EE0010216	GFO-0010216-001	GO10216

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 GE Additive for the research and development of a method of manufacturing for additively produced silicon carbide (SiC) fiber composite components for utilization in energy systems. This will be accomplished by utilizing GE Additive's custom-built additive machine technology which uses light to cross-link a photocurable material, which carries solid particulate, in a layer-by-layer manner. This process allows highly complex shapes to be manufactured that would be impossible to produce using conventional methods. The photocurable material is then carbonized and the part can be densified through use of melt infiltration. The project would be completed over two Budget Periods (BPs). This NEPA determination is applicable to both BPs.

Project work would include upgrading the GE Additive DP (depth of penetration) device with a new light source that is more suitable to cure SiC-bearing photopolymers. Next, the GE Additive ceramic printer would be upgraded with a new light source and a fiber addition/alignment mechanism. Then, test specimens would be additively manufactured with fiber reinforced SiC for melt infiltration and property analysis. The printed and infiltrated samples would be measured for their thermophysical properties, flexural strength properties, thermal shock and fracture toughness properties. Lastly, representative geometries for printed, fired and infiltrated samples would be compared to demonstrate resolution and feature fidelity.

Proposed project activities by location are listed below:

GE Additive, West Chester, OH

- Activities include SiC baseline slurry printing process development, modifications of ceramic printer to enable 3D printing of chopped fiber SiC test coupons, printing of test samples, and debind process development

GE Global Research Center, Niskayuna, NY

- Activities include SiC fiber coating and chopped fiber process development

Oak Ridge National Laboratory, Oak Ridge, TN

- Activities include secondary process developments such as SiC reactive melt infiltration, material characterization and property testing for thermophysical, flexural strength, thermal shock, and fracture toughness

The project would involve the use and handling of various hazardous materials and solvents. All such handling would occur in-lab and each site is dedicated to proper hazardous materials handling and disposal practices. All hazardous materials would be managed in accordance with federal, state, and local environmental regulations. Existing corporate health and safety policies and procedures would be followed at all sites, including employee training, proper protective equipment, engineering controls, monitoring, and internal assessments. All project work would be performed at existing, purpose-built laboratory or manufacturing facilities. No modifications to existing facilities, ground disturbing activities, or changes to the use, mission, or operation of existing facilities would be required. No additional permits, licenses, or authorizations would be required.

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:

Advanced Manufacturing Office
NEPA review completed by Andrew M. Montano, 10/25/2022

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: _____



Casey Strickland

NEPA Compliance Officer

Date: 10/25/2022

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: _____