

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Development of Multi-Axial Failure Criteria for Nuclear Grade SiCf-SiCm Composites – University of South Carolina

SECTION B. Project Description

The University of South Carolina, in collaboration with General Atomics (GA) and Westinghouse Electric Corps, proposes to establish multi-axial failure criteria for nuclear grade silicon carbide fiber and silicon carbide matrix (SiCf-SiCm) composites. A unique set of testing methods place the SiCf-SiCm in various well-controlled uniform multi-axial stress states and measure their responses. Multi-axial failure criteria will be constructed based on these test results and then validated using samples tested under more complex state of stress. Material characterization and finite element modeling at multiple geometric scales will be utilized to help elucidate the complex deformation, progressive damage, and failure behavior of nuclear grade SiCf-SiCm Composites.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage/Waste Disposal and Waste Generation – During manufacturing of SiC composite, hydrogen, helium gases, and methyltrichlorosilane will be used as part of the coater operation. Hydrogen chloride will be generated as a byproduct of the chemical vapor infiltration (CVI) process. The scrubber of the coater system contains sodium hydroxide solution. While larger amounts of these chemicals are safety stored on site, less than 5 gallons (or 10 pounds) of these chemicals are in use at any given time, and end waste is typically less than 10 gallons per month. GA has performed a thorough safety analysis resulting in a hazardous work authorization detailing safe use, storage, and disposal of CVI coater related chemicals and ensuring all federal, state, and local regulations are met. Training is required annually for all employees in Hazard Communication and Hazardous Waste Management. Chemical/Hazardous waste to be generated by the project will be characterized, labeled, and otherwise profiled appropriately, and managed as hazardous waste through a licensed hazardous waste management contractor currently under contract with GA.

Water/Well Use and Discharge of Wastewater – Wastewater has been thoroughly analyzed and is in full compliance with GA Industrial Wastewater Discharge Permit conditions and in accordance with Federal Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System guidelines for permitted facilities.

SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

Note: For Categorical Exclusions (CXs) the proposed action must not: 1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not “connected” nor “related” (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale 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 development.

Justification: The activity consists of university-scale research activities aimed at establishing multi-axial failure criteria for nuclear grade SiCf-SiCm composites.

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) Yes No

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer on 08/03/2018