

# DOE-ID NEPA CX DETERMINATION

**SECTION A. Project Title: Probabilistic Failure Criterion of SiC/SiC Composites under Multi-Axial Loading – University of Minnesota**

**SECTION B. Project Description**

The University of Minnesota, in collaboration with Oak Ridge National Laboratory (ORNL), proposes to develop a probabilistic failure criterion of silicon carbide (SiC)/SiC composites under multi-axial loading, and to incorporate the criterion into a reliability analysis of the structural integrity of light water reactor (LWR) SiC/SiC fuel cladding. The research will consist of three primary tasks performed by a joint effort between one university and one national laboratory. Task 1 will focus on the design of a new testing system, which is capable of producing different multi-axial stress states. The system will be used to test SiC/SiC composites under different stress states. Task 2 will use acoustic emission and X-ray tomography analyses to examine the damage status of the specimens, and together with the results of multi-axial tests, a probabilistic failure criterion will be formulated. In Task 3, a finite weakest-link statistical model will be developed for SiC/SiC composites under multi-axial loading. The model will be calibrated and validated by the proposed multi-axial tests.

**SECTION C. Environmental Aspects / Potential Sources of Impact**

The university has procedures in place to handle any waste that will be generated through this project. The action would not create additional environmental impacts above those already permitted at the university.

**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 designed to develop a probabilistic failure criterion of SiC/SiC composites under multi-axial loading.

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