

# DOE-ID NEPA CX DETERMINATION

**SECTION A. Project Title: Microstructure Experiments-Enabled MARMOT Simulations of SiC/SiC-based Accident Tolerant Nuclear Fuel System – North Carolina State University**

**SECTION B. Project Description**

North Carolina State University proposes to characterize steam attack, hydrothermal corrosion, and radiation swelling of SiC/SiC composites-based accident tolerant fuel (ATF) using a combination of experiments, microstructure evaluation and phase-field simulations using MARMO – a MOOSE-based code. Components of this project include steam exposure and hydrothermal corrosion tests, ion irradiation experiments and electron microscopy examination, 3D mapping of the microstructure using non-destructive x-ray microscopy and mechanical tests, and microstructure evolution with chemical kinetics in MARMOT under normal/accident conditions and under different irradiated conditions followed by validation against experimental results.

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

North Carolina State 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 aimed at investigating steam attack, hydrothermal corrosion and radiation swelling of SiC/SiC-based accident tolerant fuels.

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

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 09/13/2016