

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Radiation-induced Swelling in Advanced Nuclear Fuel – University of Tennessee, Oak Ridge National Laboratory

SECTION B. Project Description

The University of Tennessee (UT), in collaboration with Oak Ridge National Laboratory (ORNL), proposes to investigate the effects of radiation exposure on the microstructure of advanced fuel materials under normal and accident scenarios. UT will utilize state-of-the-art ion-beam experiments coupled with synchrotron X-ray characterization primarily at the Advanced Photon Source (APS) at Argonne National Laboratory (requiring only microgram samples) to obtain detailed nanoscale information on defect formation through volumetric swelling and microstrain, as well as defect kinetics and recovery at high temperatures. The tasks associated with this project are (1) Sample synthesis (ORNL lead); (2) Irradiation experiments (planned for GSI Helmholtz Center in Darmstadt, Germany); (3) Advanced characterization; and (4) Annealing and reactivity studies. Existing laboratory facilities will be used.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use and Radioactive Waste Generation – Only milligrams of radioactive materials (UC, UN, and UO₂) will be used for the experiments. UT has laboratories to handle radioactive material and Radiation Safety will oversee use and disposal of radioactive materials and waste. Generated wastes is minimal and will be disposed of through UT Radiation Safety. ORNL facilities and storage, emergency, and health and safety measures are adequate for safety and environmental compliance.

Mixed Waste Generation, Chemical Use/Storage, Chemical Waste Generation, and Hazardous Waste Generation –ORNL facilities are appropriate for the handling and disposal of chemical and radioactive wastes and ORNL procedures for storage, disposal and emergencies are in place for the safe and environmentally compliant conduct of this research.

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.

B3.10 Siting, construction, modification, operation, and decommissioning of particle accelerators, including electron beam accelerators, with primary beam energy less than approximately 100 million electron volts (MeV) and average beam power less than approximately 250 kilowatts (kW), and associated beamlines, storage rings, colliders, and detectors, for research and medical purposes (such as proton therapy), and isotope production, within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible), or internal modification of any accelerator facility regardless of energy, that does not increase primary beam energy or current. In cases where the beam energy exceeds 100MeV, the average beam power must be less than 250 kW, so as not to exceed an average current of 2.5 milliamperes (mA).

Justification: The activity consists of university-scale research activities to study the effects of radiation damage on advanced reactor fuel microstructure.

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 08/20/2019