

SECTION A. Project Title: Oxidation Study of High Temperature Gas-Cooled Reactor TRISO Fuels at Accidental Conditions – Virginia Polytechnic Institute and State University**SECTION B. Project Description**

Virginia Polytechnic Institute and State University, in collaboration with the Idaho National Laboratory (INL), proposes to study the oxidation behaviors of High Temperature Gas-Cooled Reactor (HTGR) tristructural isotropic (TRISO) fuels during accidental air and water vapor ingress conditions, and provide a comprehensive understanding of the behaviors so that HTGRs can be operated with the highest safety, efficiency, and durability. The project will emulate air/water vapor levels at high temperatures of 800-1,600°C to study graphite oxidation/burn-off and silicon carbide (SiC) oxidation, examine both unirradiated and irradiated matrix graphite and simulated TRISO fuels to fundamentally minimize the fuel oxidation vulnerability, and develop simulation methods to predict the TRISO fuel behaviors under such accidental conditions.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use/Waste Generation – Small, micron-sized irradiated SiC layers will be fabricated at the INL’s facility at the Materials and Fuels Complex and all laboratory instructions exist. Thermogravimetric analyzer (TGA) analysis will be performed at the INL in town laboratories, at which time the laboratory instructions will be completed.

Chemical Use/Storage, Chemical Waste Disposal, and Hazardous Waste Generation – For the proposed study of the oxidation behaviors of HTGR TRISO fuels during accidental air and water vapor ingress conditions, commercially available gases, solvents, and consumables are needed. During the course of the research, different chemical wastes can be generated from these species. Some of the wastes might be acidic or basic and need to be properly disposed.

Water/Well Use and Discharge of Wastewater – For the proposed work, distilled water and regular tap water will be needed for supplies for the lab bench work, experimental container cleaning, and lab maintenance. The distilled water will be made from our lab using tap water. The tap water is through the existing water supply from Virginia Tech, as well as from the City of Idaho Falls water supply to the laboratory.

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 evaluating TRISO fuel oxidation behaviors at air and/or water ingress conditions for HTGRs.

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 08/14/2018