

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: A Novel and Flexible Approach for Converting LWR UNF Fuel into Forms that can be Used to Fuel a Variety of Gen-IV Reactors – University of Tennessee

SECTION B. Project Description

The University of Tennessee, in collaboration with Oak Ridge National Laboratory (ORNL), proposes to develop a better understanding of the reactions of thionyl chloride and various metal oxides and use this understanding to design and demonstrate a bench scale protocol produce pure, decontaminated $ZrCl_4$ and UCl_4 from complete fuel rod assemblies. Tasks to accomplish this include: (1) investigate and understand the reactions of thionyl chloride with depleted uranium dioxide and lanthanide surrogates for transuranic (TRU) and fission products (e.g., UO_2 , SrO , Sb_2O_3 , Cs_2O , La_2O_3 , Pr_2O_3); (2) study the reaction kinetics to determine if different chlorination reactions proceed at different rates so that a kinetic resolution of products may be possible in our purification strategies; and (3) use the understanding gained in objectives (1) and (2) to develop a protocol and design a reactor to demonstrate the digestion of a fuel rod “simulant” and subsequent isolation of the three major product streams.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage – This project will involve the use of chemicals normally found in a laboratory performing chemical research. All the work described here will be performed with depleted uranium and nonradioactive surrogates (e.g. rare earths, Cs, Sb, Sr) for TRU and fission products. No special protocols are required beyond those normally in place in a graduate research laboratory.

Chemical Waste Disposal – Chemical waste will be generated. All waste associated with this project will be handled under normal waste disposal protocols currently in place in the Chemistry Department at the University of Tennessee.

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 understanding the reactions of thionyl chloride and various metal oxides.

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 08/06/2018