DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-16-075

SECTION A. Project Title: A Coupled Experimental and Simulation Approach to Investigate the Impact of Grain Growth, Amorphization, and Grain Subdivision in Accident Tolerant U3Si2 Light Water Reactor Fuel – Pennsylvania State University

SECTION B. Project Description

Pennsylvania State University, in collaboration with Rensselaer Polytechnic Institute, Idaho National Laboratory, proposes to investigate the potential impact of grain structure change, specifically grain growth, subdivision, and amorphization, on U_3Si_2 LWR fuel. U_3Si_2 samples will be fabricated, and then conventional powder metallurgy is applied to successfully form dense U_3Si_2 pellets with a density greater than 94% of theoretical. Polycrystal and bicrystal annealing experiments will be conducted to determine the reduced grain boundary mobility for specific grain boundary types. In order to determine if LWR fuel will amorphize during reactor operation, ion irradiation will be employed.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – Experiments will involve handling uranium silicide powders including weighing and milling in a specifically designated glove-box and consolidation in a confined apparatus into dense ceramic pellets for characterization by spark plasma sintering. The quantities of processing and sintering depleted silicide pellets will be at the level of 1 gram. There will be no radioactive stream from the lab. The procedures in handling, processing, and sintering uranium-contained dense ceramic pellets have been established and approved by RPI radiation safety office.

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 small-scale research aimed at investigating U_3Si_2 for use as accident tolerant light water reactor.

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

Approved by Jason Sturm, DOE-ID Deputy NEPA Compliance Officer on 07/27/2016