

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Total Mass Accounting in Advanced Liquid-Fueled Reactors – The Ohio State University

SECTION B. Project Description

The Ohio State University proposes to validate a radioactive tracer dilution (RTD) method for fuel-bearing molten salt mass determination at a small scale to evaluate the possibilities of its deployment in nuclear material accounting (NMA) scenarios such as in advanced molten salt reactors. The method is based on dissolving a radioactive tracer of known activity into the fuel salt mix. A small salt sample from the mixture will be collected and measured for its mass and activity. Mass-to-activity ratio of the salt sample can then be used to determine the unknown salt mass in the original container, loop, or system. In the proposed study, a small fuel-bearing salt sample will be prepared and mixed thoroughly with a beta+ radioactive tracer of known activity. The fuel-bearing salt and tracer mixture will be irradiated at a research reactor to introduce a full spectrum of fission products, thereby, going a step further to simulating the complex NMA scenario in advanced liquid-fueled reactors, for example in the molten salt loop of a liquid-fueled molten salt reactor (LFMSR). This study at a small scale using a research reactor will make a case for assessment of the suitability of RTD method to further scale-up studies and identifying new challenges. The study will focus on addressing the challenges of high fission products' gamma-ray spectral interference to the tracer's gamma peak counting, with attention paid to a suitable spectrum analytical procedure to correct for the interferences, providing first-hand experimental data to support the RTD technique for total mass accounting in advanced liquid-fueled reactors.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university (and its partner university) have 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 occurring at the universities.

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). For purposes of this category, "demonstration actions" means actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. Demonstration actions frequently follow research and development and pilot projects that are directed at establishing proof of concept.

Justification: The activity consists of an investigation to prove the accuracy, reliability, and efficacy of the RTD method for NMA in LFMSRs.

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

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer, on 09/09/2021.