DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-21-086

SECTION A. Project Title: High-fidelity modeling of fuel-to-coolant thermomechanical transport behaviors under transient conditions – University of Florida

SECTION B. Project Description

The University of Florida proposes to develop a high-fidelity modeling tool that can capture the important phenomena in high burnup UO_2 and accident tolerant fuels (ATF) during transient conditions. Accurate modeling of the time-dependent phenomena that impact material performance must be used to determine the figures of merit and safety margin. Phenomena such as fuel fragmentation, cladding oxidation, pellet-clad interaction, clad ballooning, and clad rupture are examples that pose challenges to modeling during these transients. In this 3-year project, the research scope will focus on the development of high-fidelity tightly coupled multi-physics tools that can capture the time-dependent material response and associated thermal hydraulic conditions during these events. These tools will be validated against existing separate effects tests and in-pile integral experiments and will be used to model Transient Reactor Test facility (TREAT) loss-of-coolant accidents (LOCA) experiments. The project is broken up into the following: (i) BISON and FAST improvements focuses on adding modeling capability for high burnup UO_2 and ATF fuels and testing the coupling to TRACE/PARCS, (ii) BlueCRAB model development will focus on developing models of existing experimental setups as well as planned TREAT experiments, (iii) BlueCRAB model validation will focus on validating the new physics modeling and coupling using existing experimental data and any data obtained from recent TREAT experiments.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university has 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 university.

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 develop a high-fidelity modeling tool that can capture some of the important phenomena in high burnup UO_2 and Accident Tolerant Fuel designs during transient conditions.

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 09/17/2021.