

SECTION A. Project Title: Safety Implications of High Burnup Fuel for a 2-Year PWR Fuel Cycle – University of Tennessee**SECTION B. Project Description**

The University of Tennessee (UT) proposes to perform a safety analysis of high burnup fuel for a Westinghouse Pressurized Water Reactor (PWR). The safety analysis encompasses normal operation and selected anticipated operation occurrences (AOOs) and design basis accidents (DBAs). The work aims to identify potential opportunities and gaps for high burnup fuel by utilizing both well-established and modern methodologies to model fuel performance, reactor physics, thermal-hydraulics, and plant system-level response. UT will also evaluate implications of near-term accident tolerant fuel (ATF) candidates compared to traditional O₂/Zircaloy fuel system for high burnup fuel. Additionally, UT will leverage advanced experimental capabilities for accident performance of ATF cladding at ORNL to better inform the simulations. In this project, UT will advance the state-of-knowledge, by considering a 24-month fuel cycle and high burnup fuel. Extension of PWR cycle lengths to 24 months, achieved by increasing enrichment with a concomitant increase in fuel burnup, provides economic benefits by improving fuel utilization and reducing operating and fuel cost. However, a technical basis for extension of the rod average burnup regulatory limits is required. A high burnup fuel design must meet all design goals and constraints as listed by the NRC fuel Standard Review Plan (SRP) including fuel system damage (with the impact of fatigue and hydrogen pickup), fuel rod failure (including excess fuel enthalpy and mechanical fracturing) and fuel coolability limits (including fuel ballooning and expulsion).

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 identify opportunities and gaps for high burnup fuel in context of a 2-year PWR fuel cycle.

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 09/21/2021.