
Safety Implications of High Burnup Fuel for a 2-Year PWR Fuel Cycle

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ABSTRACT:

The objective of this project is to perform 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). Our team is very experienced in both fuel performance modeling and core design modeling. **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.** We will also evaluate implications of near-term accident tolerant fuel (ATF) candidates compared to traditional UO₂/Zircaloy fuel system for high burnup fuel. Additionally, we will leverage advanced experimental capabilities for accident performance of ATF cladding at ORNL to better inform our simulations.

The key for successful completion of the stated objectives lies within the multidisciplinary proposing team. The team has decades of successful collaboration among them on development and utilization of the proposed tools for PWR and near-term ATF applications (see the attached Benefit of Collaboration and Curriculum Vita documents). The university team is made up of reactor analysis, systems, and fuels experts who will closely collaborate under the guidance of a leading utility with highest invested interest in high burnup fuel and its fuel vendor. To maximize impact on the high burnup program with its near-term goals, we have to perform these tasks in a 2-year time frame. As such, we have included INL and ORNL, the two leading lab contributors on the existing high burnup fuel program to accelerate the project findings and ensure synergy to meet DOE and industry programmatic goals.