Improving Nuclear Safety Through Multiphysics Modeling and Simulations

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Abstract

At Oak Ridge National Laboratory (ORNL), the COMSOL Multiphysics software has become a reliable and important resource to estimate and assess thermal safety margins for several nuclear applications. This poster presentation will highlight some of the ongoing activities in the following areas: (1) Highly enriched uranium (HEU) to low enriched uranium (LEU) conversion of the High Flux Isotope Reactor (HFIR), (2) New and improved safety analysis capabilities for the present HFIR HEU core, (3) Plutonium-238 isotope production in HFIR for the National Aeronautics and Space Administration (NASA)'s deep space missions, (4) HFIR beam line safety analysis, (5) Design, safety analysis and technical reviews for material irradiation tests in HFIR, (6) Centrifugal pump design and performance characterization for molten salt reactors and test loops and (7) scoping design evaluations for the Transformational Challenge Reactor (world's first-of-its-kind "3D printed" nuclear reactor).