NE-20-23742, Graphite Finite Element Model Verification

Ultra Safe Nuclear Corporation – Technologies (USNC-Tech), a wholly-owned subsidiary of Ultra Safe Nuclear Corporation (USNC), is a technology development company dedicated to identifying and enabling the commercial development of advanced nuclear technology for terrestrial- and space-based applications. USNC has developed a finite element model (FEM), the Nuclear Graphite Interactive Material Model and Simulation Environment Model and released it as open source software. To optimize the design and lifetime estimates of the graphite components, it is necessary to create a benchmark and analytical solution that will verify the USNC FEM model.

This project will use Oak Ridge National Laboratory's random fields finite element model (RFEM) and expertise in graphite to generate independent, confirmatory analytical solutions, and benchmarks for USNC's graphite FEM that will ultimately be used in the final MMR™ reactor design and licensing submissions.

The benchmarks, analytical solutions, and failure criteria developed during this project will be used directly by USNC-Tech to evaluate the current graphite core design of the MMR™ reactor, resulting in an optimized core and a down-selection of the graphite used for the core. The USNC FEM code verification will enhance the fidelity of the modeling and support the safety cases of MMR™ reactor applications.