NE-26-38854 Uncertainty Quantification and Sensitivity Analysis Support for NANO Nuclear Reactor Design Using ORNL's Tools – SCALE/TSUNAMI

NANO Nuclear Energy, located in New York, NY, is developing the KRONOS microreactor, a high-temperature gas-cooled, TRISO-fueled system designed to deliver dispatchable carbon-free electricity and process heat for industrial and commercial applications. As a first-of-a-kind advanced reactor, KRONOS requires rigorous uncertainty quantification (UQ) and sensitivity analysis to demonstrate safety margins, performance reliability, and licensing readiness.

NANO proposes to partner with Oak Ridge National Laboratory (ORNL) to apply the SCALE/TSUNAMI code suite to quantify the impact of nuclear data, modeling assumptions, and operational parameters on key reactor physics metrics, including reactivity, power distribution, and temperature coefficients. ORNL's NRC-recognized analytical tools and expertise will enable development of a validated UQ framework tailored to the KRONOS design.

This collaboration will strengthen confidence in design margins, reduce regulatory uncertainty, and support pre-licensing engagement with DOE and the NRC. The resulting analysis framework will accelerate KRONOS design maturation and contribute to commercialization of scalable, advanced microreactor technology.