

NE-20-23946, Pebble Bed Large Eddy Simulations for Lower Order Methods Benchmarking and Uncertainty Quantification Development

Kairos Power is a new nuclear energy technology and engineering company whose mission is to enable the world's transition to clean energy, with the ultimate goal to dramatically improve people's quality of life while protecting the environment. This goal will be accomplished through the commercialization of the fluoride-salt-cooled, high-temperature reactor (FHR) that can be deployed with robust safety, affordable costs, and flexible operation to accommodate the expansion of variable renewables.

FHR core thermal hydraulic modeling methods employ simplified empirical correlation based porous media and heat transfer models to simulate the core thermal hydraulic behavior. Large Eddy Simulations (LES) are aptly suited to produce numerical benchmark data that captures local velocity and temperature effects. LES results can be used to further understand the different modes of heat transfer in an FHR core for different operation and accident scenario conditions.

Argonne National Laboratory will provide expertise in LES and turbulence modeling and the availability of their large computational resources. This data will have an immediate impact to accelerate technology development, enable economic optimization, and reduce regulatory uncertainty.