**RFA-17-14580, Nuclear Energy Advanced Modeling and Simulation Program Thermal-Fluids Test Stand**

Kairos Power's unique approach to reactor plant design relies on a rapid iteration process between component design, modeling and simulation, prototyping and testing. To date, most fluoride-salt-cooled, high-temperature reactor (FHR) modeling and simulation efforts at universities and national laboratories have been focused on establishing the technical and scientific basis to design and license FHRs. These efforts have involved the use of legacy codes with little interaction with the high-fidelity computing community within DOE, such as the Nuclear Energy Advanced Modeling and Simulation program. Further development of the FHR technology by Kairos Power involves design optimization of key systems, structures, and components for commercialization. The main challenge posed by this novel approach is to use appropriate tools (measured by the code's fidelity to the governing physics involved) at all levels of the design iteration and optimization process, from the lower length scale up to the full reactor plant scale.

The goal of the project is to utilize a multi-scale thermal-fluids hierarchy analysis methodology to develop a functional Nuclear Energy Advanced Modeling and Simulation program thermal-fluids test stand at Kairos Power. This will involve code coupling and development of a streamed process to implement closure models from high- to low-fidelity codes. Through this project, the goal is for code developers at Argonne National Laboratory and Idaho National Laboratory to collaborate closely with code users at Kairos Power to implement and demonstrate the functionality of such a test stand to the Kairos Power design optimization process for a key component of the Kairos Power FHR design.