

## **RFA-17-14575, Development of the Micro-scale Nuclear Battery Reactor System**

This project defines a micro-scale nuclear battery (MsNB) as a nuclear (fission) heat source capable of providing heat to power a small commercial gas turbine on the order of 5 MWe. Currently, several molten salt reactor designs are actively being pursued; however, most share two design features that provide design and operational complexity: pumps to circulate the reactor molten salt (i.e., primary flow, and several stages of conventional tube and shell type heat exchangers and associated circulating pumps). The MicroNuclear team embraced the challenges associated with pumps and heat exchanger design, and developed an alternative reactor configuration that accomplishes the objective of design simplification. The ansatz of the proposed concept will (1) eliminate pumps by providing a natural circulation primary flow design and (2) eliminate heat exchanger tubes with the application of passive heat pipes. The configuration of this reactor design is an entirely novel concept.

MicroNuclear will collaborate with Idaho National Laboratory to expand development of the MsNB concept. Preliminary analyses indicate the fundamental efficacy of the concept in terms of MsNB size/scale from steady state neutronics calculations, natural circulation and heat transfer estimates. Further refined computational analyses are required to advance the technical understanding and to assess technology readiness level for this concept.