

## **NE-21-25117, Density Measurements of Plutonium Bearing Salts via Neutron Beam Dilatometry**

TerraPower, one of two Advanced Reactor Demonstration Program recipients, is a nuclear energy technology company based in Bellevue, Washington. TerraPower is developing the Molten Chloride Fast Reactor and the Molten Chloride Reactor Experiment to further their mission to “provide the world with clean, safe, affordable, and reliable energy, and improve quality of life without burdening the environment.”

Currently, there is no open literature on density data for some compositions of plutonium-bearing salts. Archived data needs to be vetted because referenced values may not agree or do not allow for measurement uncertainty. System performance relies on measurement uncertainty to fully develop design margins and boundary conditions. The density of the chloride fuel salt ultimately determines fissile mass for criticality and active core size. TerraPower seeks to confirm existing assumptions and leverage fundamental scientific principles to advance reactor design.

With the first-of-its-kind neutron radiography technique, Los Alamos National Laboratory will provide the necessary expertise to determine the density of actinide-molten salt solutions using neutron dilatometry. The visualization of molten salt samples yields extremely accurate data resulting in significantly reduced design costs—a critical component of advanced reactor commercialization.