

NE-25-37807 Thermophysical Property Measurements of NaCl-KCl-UCl₃

TerraPower, LLC is based in Bellevue, Washington. Their two-fold mission is to (1) provide the world with clean, safe, affordable, and reliable energy and (2) to improve the quality of life without burdening the environment. Part of TerraPower's advanced reactor strategy is development of a Molten Chloride Fast Reactor (MCFR): a liquid-fueled, high-temperature fast reactor designed to deliver high-efficiency, carbon-free power while consuming actinide isotopes.

One challenge in the design, licensing, and operation of demonstration and commercial-scale MCFR is accurate, uncertainty-quantified thermophysical property data for molten fuel salt. TerraPower has determined that a lower operating temperature would allow for use of materials conforming to ASME Section III Division 5 and improve corrosion resistance which will necessitate a transition to a ternary salt system.

TerraPower will partner with Argonne National Laboratory (ANL) to generate NQA-1 qualifiable and traceable thermophysical property data for Beginning of Life (BOL) and simulated End of Life (EOL) ternary fuel salts. ANL has proven expertise in molten salt thermophysical measurement under NQA-1 standards. These results will directly inform reactor and component design, thermal hydraulic modeling, safety margins, and licensing strategies.