

NE-22-28334 Advanced Functional Membrane Testing for Noble Gas Management in a Molten Salt Reactor

Elysium Industries USA (located in New York, NY) is a nuclear design vendor dedicated to helping solve energy poverty and pollution by recovering the energy content in existing nuclear waste through molten salt reactor technology. They are currently focused on designing, licensing, and constructing a 10 MWth Fast Chloride-Molten Salt Reactor (FC-MSR) non-power demonstration unit and a nuclear waste-to-fuel salt conversion facility.

A potential source of radioactive release to the environment from the noble gas capture system represents a gap that remains to be addressed in a reactor's fundamental safety functions. Elysium will work with Pacific Northwest National Laboratory (PNNL) to evaluate a metal-organic framework (MOF) for continuous separation of Xe and Kr from the off-gas in the FC-MSR. Specific tasks include fabrication of the MOF, permeation and selectivity of the MOF membrane, and assessment of Xe and Kr storage in a canister. PNNL has expertise in the areas of functional materials, membranes for noble gas separation, and facilities to test these components. This project will help optimize the noble gas management of the FC-MSR and chemical processes for fuel salt production and conditioning and support the safety and licensing bases.