
Nuclear Material Accountancy During Disposal and Reprocessing of Molten Salt Reactor Fuel Salts

PI: Stephen Raiman - Texas A&M University

Collaborators: Shaheen Dewji - Georgia Institute of Technology, Michael Dion – Oak Ridge National Laboratory

Program: FC-3 Materials Protection, Accounting and Control Technology

ABSTRACT:

A credible material control and accountancy (MC&A) strategy for liquid fueled molten salt reactors requires identification and evaluation of locations where fuel may accumulate, known as hold-up. The diffuse location of fuel poses challenges at several operational stages, all of which must have credible approaches to ensure regulatory compliance. One such potential challenge is disposal and decommissioning of salt-wetted components. It is desirable, from an MC&A standpoint, to fully account for deposited fuel disposal of these salt-wetted components. Therefore, the development of a methodology that allows quantification of fuel material present on salt-wetted components would be extremely beneficial for MC&A and reduce costs associated with more invasive procedures.

The objective of this work is to develop and validate a method for measuring and predicting hold-up to mitigate operational risks and expenses during disposal, decommissioning, and reprocessing of salt-wetted MSR components. These objectives will be met by testing robust measurement/detection methods on simple components wetted with uranium-bearing fluoride salts, then validating them on a drained molten salt loop with characteristic geometry and components. These steps will elucidate the usefulness of the techniques and help determine optimal strategies for disposal of salt-wetted structures during decommissioning, disposal, and reprocessing of fuel salts. Measurements will be used to inform a computational modeling effort aimed at creating a tool for predicting hold-up in a variety of MSR designs and fuel salt types. This information can be used by vendors during development of an MC&A plan for licensing.