

NE-19-18380, Liquid Fluoride Thorium Reactor (LFTR) Preliminary Safeguards Assessment

Flibe Energy, Inc., is developing the Liquid Fluoride Thorium Reactor (LFTR) concept, an innovative two-fluid molten-salt nuclear reactor coupled to a closed-cycle gas turbine for power generation. Once started with high-²³³U-content fuel, the LFTR would require no fissile replenishment during its operation, eliminating the need for uranium enrichment infrastructure. LFTR would also eliminate fuel fabrication and utilize internal chemical processing to purify its fuel salt and remove fission products. At the end of its operation, the salts are to be recycled to the next generation of LFTRs. This strategy would nearly eliminate the production of long-lived radioactive wastes and retain all actinides in useful operation in a steady-state environment.

LFTR introduces unique safeguards challenges, including high-²³³U-content fuel, flowing liquid fuels, and high radiation fields complicating access for inspections. These considerations may require changes in the LFTR design and/or operations, development of safeguards technology, or new safeguards approaches. Completing an evaluation of the viability of the LFTR to secure future investment and development will require support from the safeguards and modeling expertise at Oak Ridge National Laboratory (ORNL). ORNL has the unique tools to perform this assessment and detailed knowledge of molten salt reactor technologies. ORNL also has specific expertise and experience in destructive and non-destructive assay techniques, safeguards technology and approaches, and experience in the full lifecycle of required safeguards technology development.