

NE-19-18709, Improvements to SAS4A Severe Accident Modeling Capabilities to Support Licensing and Commercialization of TerraPower's Traveling Wave Reactors

A major difficulty for the traveling wave reactor (TWR) technology commercialization, as with any other advanced non-light water reactors, is the need for a modernized regulatory infrastructure. To address this, the Nuclear Regulatory Commission is engaging with the Licensing Modernization Project (LMP) to look at their proposed technology-inclusive, risk-informed and performance-based licensing framework. The LMP relies on probabilistic risk assessments to make risk-informed selection of Licensing Basis Events (LBEs) based on their frequency and estimated consequences. Implementing that framework will therefore require the ability to model the TWR plant LBEs that may progress to core damage.

Argonne National Laboratory (ANL) has developed an in-depth understanding of the behavior of the various systems, structures, and components during off-normal events and how it affects overall performance, safety, and feasibility through knowledge encapsulated in SAS4A/SASSYS-1. This ANL-developed software leverages nearly five decades of Department of Energy investment in fast reactor safety analysis capabilities.

TerraPower and ANL will develop additional capabilities within the SAS4A code that analyzes a postulated severe accident leading to coolant boiling and/or fuel failure. The updated version of SAS4A/SASSYS-1 with these severe accident modeling capabilities would allow TerraPower to more credibly model events leading to fission product releases to design, license, and commercialize TWR reactors.