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Scoping Analysis of STELLA-2 using MARS-LMR

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To support the development of Prototype Gen IV Sodium-cooled Fast Reactor (PGSFR), the Sodium Integral Effect Test Loop for Safety Simulation and Assessment (STELLA) program has been launched and the basic design of STELLA-2 facility was completed in 2015. The STELLA-2 is a scaled facility including all the major systems and components in PGSFR and is able to simulate the transient behavior. For the scoping analysis of STELLA-2, the representative design basis event (DBE) analysis was conducted and evaluated by using MARS-LMR code with the same assumption and approach of PGSFR. The Loss of Flow (LOF) accidents with the Loss of Offsite Power (LOOP) was the target event and the result of PGSFR and STELLA-2 were compared. In general, the flow trend well-followed the PGSFR behavior whereas the temperature trend was inconsistent with the PGSFR result. Several design issues and analysis issues were found and the solution for each problem was also suggested. After the improvement/modification of the STELLA-2 input, it was verified that the both flow and temperature trend well-follows the PGSFR transient behavior. These issues are expected to be handled in the installation and manufacture stage of STELLA-2. For further study, various sensitivity tests on key factors are planned. Furthermore, more DBEs are under consideration to be analyzed and evaluated.

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