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Benchmark Between EDF And IPPE On The Behavior Of Low Sodium Void Reactivity Effect Sodium Fast Reactor During An Unprotected Loss Of Flow Accident

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The validation of severe accident analysis codes for Sodium Fast Reactors (SFR) is a difficult task as it is not possible to carry out full scale integral experiments. Therefore, in addition to the validation of specific models with dedicated experiments, it is of the utmost importance to increase the confidence we have in these codes by performing benchmarking exercises with independent codes and by independent teams. As EDF R&D and IPPE are both interested in the analysis of the behavior of low Sodium Void Reactivity Effect (SVRE) cores during severe accidents, whether to support R&D on the ASTRID project (conducted by CEA) or to support R&D on the BN family reactors, a benchmarking exercise has been launched in this purpose.

As a first step, a low SVRE core design has been developed especially for this benchmark. Its main neutronics properties related to severe accident behavior - sodium density and void effect and fuel Doppler effect - have been evaluated with the CEA code ERANOS for EDF and with TRIGEX for IPPE and are compared in this article. Finally, the primary phase of an Unprotected Loss Of Flow (ULOF) accident has been simulated by each partner. On EDF side, the SIMMER code has been used whereas IPPE performed its calculations with its code COREMELT. Main results concerning power evolution and sodium boiling are compared.

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