



Contribution ID: 141

Type: Poster

Approach to Development and Validation of Code for Safety Analysis of RITM 200 SMR under LOCA Conditions

The NPP with RITM-200 SMR is currently being designed and constructed in Russia. In this regard, for licensing purposes, work is being done on the development, validation and verification of the code intended for modeling of accidents under design extension conditions (DEC).

Due to the fact that the coolant and some of the structural materials used in the SMR are the same as those used in conventional LWRs, the expertise and experience of LWR modeling technology under DEC is widely used in the code development. At the initial stage of the code development, calculations of representative LOCA accidents with available thermal-hydraulic and severe accident models were performed to obtain preliminary conditions of core degradation, which are the initial data for performed and planned experiments.

In parallel with the performance of severe accident experiments and the development of appropriate models, validation of models that do not require modifications is carried out. The area of validation defined by regime parameters differs from traditional LWRs and is determined on the basis of preliminary calculations of accidents. The validation procedure is performed using a modern approach based on ASME V&V 20 Standard, which allows to quantitatively take into account uncertainties of measurements and modeling results. The modelling error is estimated during code validation for parameters important for safety. For these parameters acceptance criteria are defined by the reactor designer.

The approach adopted in the development, using the experience of severe accident code development for VVERs, allows to quickly and efficiently perform the development of a new code for safety analysis of NPP with RITM-200 SMR.

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Track Classification: Topical Group C: Safety, Security and Safeguards: Track 8: Demonstrating SMR's Safety Case