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Assessment of accuracy from the use of point kinetics when analyzing transition processes in high power fast reactor

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“Point kinetics” approximation is widely used in reactor justification for calculation of transient and emergency modes in the first place. The point kinetic model is used as the base model for Russian DINROS, GRIF, SOKRAT-BN software programs used for safety justification of fast reactors. Its popularity is explained by its relative simplicity and physical transparency (possibility to interpret results on the language of reactivity effects and easily demonstrative verification).

Computational study of errors caused by the use of point kinetic model is performed with the use of UNICO multi-physical software (3D neutronics in diffusional approximation + 3D thermohydraulics) for three non-static test example problems for BN-1200 reactor:

- The problem of sudden change of coolant temperature at the inlet of pressure header of reactor core (in one of 4 first circuit loops).
- Emergency protection rods drop at nominal power (example of fast running process).
- Self-act of one of the control rods.

It is shown that fuel rod temperature estimation error during self-act of one of the control rods can reach 100°C.

Country/Int. Organization

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