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APPLICATION OF DIGITAL TWIN OF FAST REACTOR PLANT FOR CONTROL SYSTEM ALGORITHM TESTING

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Enhancement of efficiency of state-of-the-art computation systems and software modernization make it possible to elaborate computer model development technology to the technology of super-computer twin development. The reactor plant supercomputer twin implies three levels of detailing:
- The upper level model permitting consideration of effects of non-isothermal coolant flows, distribution of power density fields in the core, neutron flux expansion to ionization chambers. The model is implemented based on integration of 3D codes by means of special software and permits to perform multi-physical computations of different operation modes of reactor plants.
- The medium level model intended to perform dynamic analyses and considering effects obtained at multi-physical computations. It is implemented on the basis of associated neutron and thermal-hydraulic analysis controlled by the control system model.
- The real-time model intended to adjust and optimize control system algorithms of the reactor plant. It is implemented based on data obtained from the developed models of upper levels.
Super-computer multi-processor computations and application of state-of-the-art 3D computation codes, thermal-hydraulic and neutronic models permit to use this tool at all life cycle stages:
- at the design stage to justify normal operation modes, modes with equipment failures and emergency modes; adjustment of control algorithms of equipment and systems;
- at the stage of Automated Process Control System development to master at the test facility and to test equipment;
- at the stage of operation, as a tool for training of operators and to trace plant-prototype condition.
This paper presents description of digital twin development technology of the fast reactor plant and its application for control system algorithm testing.

Country/Int. organization

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