Contribution ID: **226** Type: **POSTER**

The optimization of core characteristics of fast molten salt reactor based on neutron-physical and thermal-hydraulic calculations and the analysis of fuel cycle closure options

Tuesday 27 June 2017 17:30 (1h 30m)

The growing importance of nuclear energy in the overall balance calls for the further improvement of existing nuclear reactors. However, it is equally important that other reactor types are also considered. The report represents the concept of fast molten salt reactor, neutron-physical and thermo-hydraulic calculations for several core models. It also presents the analysis of different core configurations including cylindrical, elliptical, and the block model with partition of energy generation and energy transmission functions. For further study the choice of geometry has been made based on criteria developed. After calculation of neutron-physical characteristics the optimization of core geometry has been carried out. The result of calculation of effective fraction of delayed neutrons is given.
The modeling of nuclide composition evolution till steady-state operations has been carried out taking into account partial recycling of soluble and non-soluble fission products. Change in nuclide compossition of uranium, plutonium and basic minor actinides is given. Time to reach steady-state has been determined.
Based on obtained power density the thermo-hydraulic calculation was carried out. There have been determined maximal temperature of core structures, density profile and fuel salt velocity.

Country/Int. Organization

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Session Classification: Poster Session 1

Track Classification: Track 1. Innovative Fast Reactor Designs