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Burnup Analysis for BN-600 Reactor Core fueled with MOX fuel and Minor Actinides

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The BN-600 reactor is a sodium-cooled fast breeder reactor, built at Russia. Designed to generate electrical power of 600 MW in total. IAEA has considered the reactor for many phases of benchmark problems.The coordinated research project activities were started in 1999 and included studies fora so-called hybrid BN-600-reactor-type core model, partially fuelled with highly enriched uranium and partially, about 20% of ‘‘fuel subassemblies (FSAs),’’ with MOX (Phases 1 to 3), a full-MOX core model with weapons-grade plutonium (Phase 4), a model of the BFS-62-3A experimental critical configuration, a mockup of the hybrid core (Phase 5) and, finally, a full-MOX core model with plutonium and Minor Actinides coming from spent nuclear fuel (Phase 6).

Computer Code Model.

MCNPX code , based on Monte Carlo method , is used to design a three dimensional and typical computer model to the reactor , all core zones radially and axially are represented in the model . Figure 1. illustrate typical horizontal and vertical layout of the model. BN-600 core MOX contains three radial fuel zones , Low enrichment (LEZ) , Medium enrichment(MEZ) and Higher enrichment (HEZ) zones respectively. Radially beyond the HEZ outer zone are two steel shielding zone(SSA1 and SSA2) [1]. The reactor core is controlled by two types of control rods SHR and SCR. Minor actinides 5 % [2, 3] was added to each fuel zone to analyse and study burnup and transmutation of Minor actinides inside the fast reactor core. A core cycle of 140 days is considered for the analysis. The results calculate the reactor multiplication factor , flux and power distributions. Kinetic and safety parameters of the reactor core, also Incineration and burn up of minor actinides at EOC are evaluated.

References

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