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FEATURES OF THE NUCLEAR FUEL CYCLE SYSTEMS BASED ON JOINT OPERATION OF FAST AND THERMAL REACTORS

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In a time of the existence of the national nuclear program in the framework of the weapons and civil complex it has been accumulated and continues to accumulate a significant amount of plutonium.

The isotopic vector of plutonium produced in reactors varies strongly depending on the type of reactor, fuel burnup and the time elapsed since the moment of unloading it from the reactor before loading it as a fuel component in another reactor.

It is fundamental fact that in a two component nuclear power system based on thermal and fast reactors, there is plutonium exchange between these types of reactors in a joint closed nuclear fuel cycle (NFC). Plutonium vectors coming into fast and thermal reactors can vary within a wide range because they will not only depend on the reactor features, but also on NFC management.

The neutronic properties of plutonium isotopes differ also dramatically also. This leads to the fact that the physical characteristics (including safety features) of the reactor, in which the plutonium is used as fuel, will depend on the isotopic vector.

The aim of the paper is to determine the characteristics of stationary fuel cycles of nuclear power system based on VVER-TOI and BN-1200 loaded with oxide fuel of various compositions. Characteristics of reactor systems with a partial or complete recycling of spent nuclear fuel and plutonium recycled are compared with those of the reference system which consist of the VVER-TOI reactors with uranium fuel, operating in an open NFC. The results of the computational researches of the transition of the two-component system of into the equilibrium mode in the closed NFC are presented.

A feature of the system which is balanced by plutonium is that both types of reactors spent fuel is completely reprocessed and the separated plutonium is used totally to make MOX - fuel. The MOX fuel is used not only in the BN-1200, but also as a partial load in reactors VVER-TOI. The optimization of fuel the reactor fuel performances is needed for its effective cooperation.

Complete closure by plutonium in the NFC consisting only of the VVER-TOI reactors using MOX - fuel is impossible.

Country/Int. Organization

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