

Abstracts

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Correction of the Reactivity Measured by ORUK Technique

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Correction of reactivity values obtained by means of “Inverse solution of kinetics equations (ORUK)” technique are presented taking into account the changes of the neutron flux density form function and neutron detectors efficiency when negative reactivity is inserted into critical multiplying system. Form function (and efficiency) was supposed proportional to the neutron detector signal normalized by integral neutron flux density in core volume. The ratio of these signals after and before reactivity insertion is the correction factor for the measured reactivity value. Two case of correction are considered for results of reactivity measurements on the critical assemblies of RBMK: the mean measured signal of many in-core detectors or the calculated values of neutron power and spectral projection amplitude of neutron field are used for a few detectors signals normalizing and correction. The spread of different detectors results (with respect to the results of ORUK with integral signals) was decreased essentially after correction in all cases.

Key Words: critical assembly, reactivity, inverse solution of kinetics equations (ORUK) technique, space effects in reactivity, form function, detector efficiency, neutron-physics calculations.

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Using the Code TREK-RBMK for Simulation of Dynamic Processes in Simulators

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The experience of using the code TREK-RBMK for the full-scale simulators of RBMK-type reactors is shown in.

Key Words: neutron-physical calculation, RBMK, simulator.

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Comparison of Characteristics of Material Attenuating Properties in Modern Nuclear Data Libraries Based on a Numerical Simulation of Particle Transport

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There are a lot of nuclear data libraries which are the base of neutron-physic calculation. Safety and economy of a nuclear facility are depends on a correctness of nuclear data. Specialist must have reliable calculation techniques and the nuclear data libraries which he uses for both of modeling and radiation safety analisys. A comparison of calculation results is shown in the paper for simple models — spheres of various radius — using modern nuclear data libraries: ROSFOND, ENDF/B-VII.1, JEFF-3.2 and JENDL-4.0. The total flux and energy spectrum of neutrons and photons leakage from sphere surfaces with neutron californium source in a center were calculated and compared.

Key Words: radiation safety, nuclear data libraries, particle transport, shielding calculations, ROSFOND, ENDF/BVII.1, JEFF-3.2, JENDL-4.0.

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**Improvement of Technical and Economic Characteristics of the VVER-1200 Reactor
Due to the Th Involvement in the Nuclear Fuel Cycle**

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The possibility of improving the technical and economic characteristics of the VVER-1200 reactors fuel cycles due to the loading of fuel assemblies with high enrichment uranium-thorium fuel was investigated. The calculations of neutron-physical characteristics were carried out, the main features of the uranium-thorium fuel were identified during the implementation of modern VVER fuel cycles of 18 and 24 months duration. Radiation and technical and economic characteristics of fuel cycles with uranium-thorium fuel were evaluated.

Key Words: thorium, nuclear fuel cycle, high enrichment fuel, LCOE, VVER-1200, technical and economic characteristics.

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**Technical and Economic Analysis of the Use of Molten Salt Reactors for the Closure of the
Nuclear Fuel Cycle on Minor Actinides Accumulated During the Spent Nuclear Fuel
Reprocessing of Commercial Power Units VVER-1000/1200**

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It was carried out a technical and economic analysis: of the total cost reduction for the management of radioactive waste due to the burning of plutonium and minor actinides in a molten salt reactor (MSR) with a fast spectrum of neutrons; of the cost for R&D required to create a MSR; of evaluation of investment costs for the construction of a fullscale MSR 1.0 GW. Including a specialized reactor system in the nuclear power system of the country will solve the problem of closing the nuclear fuel cycle (NFC) on minor actinides and plutonium accumulated during SNF reprocessing of commercial power units VVER-1000/1200. The potential of the Mining and chemical plant allows to organize the effective functioning of the MSR for the closure of the NFC for minor actinides, using the existing radiochemical infrastructure of the site.

Key Words: VVER-1000, high level radioactive wastes, molten salt nuclear reactor, radioactive waste disposal, minor actinides, spent nuclear fuel, radioactive wastes, nuclear fuel cycle.

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**Power Sources of Nuclear Thermal Propulsion Reactors Type in the Earth Defense System
in Conditions of Asteroid-Comet Hazard**

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The conception of power sources of nuclear thermal propulsion reactors type use in the system of the Earth defense in conditions of asteroid-comet hazard is stated. Realization of the proposed conception is substantiated with unique results on the reactor physics and thermal physics, design and technology of prototypes during performance of the State program of nuclear thermal propulsion development in the Soviet Union. The created reactor IRGIT, the prototype of the nuclear thermal propulsion (NTP), and the reactor IVG, the high-power NTP reactor model, are considered as basic reactors for two lines.

Key Words: asteroid-comet hazard, nuclear reactor, nuclear thermal power and propulsion, nuclear thermal propulsion, nuclear power system, monitoring, prevention of dangerously close approach, line.

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Human Factor as a Main Aspect of Transition to Minimal Risks of Nuclear Power

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The variants of integral risks classification is given for NPP’s safe life. Alternative approach to the problems of reducing human factor risks is proposed. It is implementation of NPPs of small and medium power instead of units with high power. This approach can be specified as the method of “insurance by power”. Its quality technical and economical effects concerning lowering of different risks (such as increase of costs due to long construction period, energy supply difficulties, investor search and his financial risks, minimization of power reserve in the power system, available sites, radiation safety risks, society acceptance and possibility of tuning to pace of development for power engineering energy of regions) are shown.

Key Words: human factor, NPP of small and medium power, atomic energy system, risks, NPP safe life.

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Corrosion Mechanisms of VVER Fuel Elements (Review)

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Most of the failures of nuclear systems involve the degradation of materials as they interact with their environments. In recent years sufficient new information has accumulated to change current views on corrosion mechanisms in watercooled reactors. The total number of publications is so enormous now that it is impossible for a short review to be completely comprehensive. This review concentrates on those studies that have resulted in changing the views of the importance of various mechanisms.

Key Words: corrosion, fuel cladding, zirconium alloys, hydrogen pickup, mass transfer, oxide layer, galvanic effect.