Abstracts
Journal "Problems of Nuclear Science and Engineering. Series: Physics of Nuclear Reactors", issue No.1, 2019

UDC 621.039.56

Using Solutions of Adjoint Problems for Calculation and Numerical Simulation of Measurements of Large Reactivity

Kulikov V.I.,
St. Petersburg branch of JSC "FCSHT "SNPO "Eleron", 55, Dibunovskaya, st., Saint Petersbugr, 197183,
Zhylmaganbetov N.M., Popykin A.I., Smirnova A.A.,
SECNRS, 2/8 (bld. 5), Malaya Krasnosel'skaya st., Moscow, 107140

The article discusses the relationship between the calculated reactivity $\rho = 1 - 1/k_{ef}$ obtained from steady-state calculations and its measured analogous. In VVER reactors the measured reactivity is determined from the readings of reactivity meter that processes IC current using the inverse point kinetics equation. In the article a connection is established between the reactivity obtained from steady-state calculations and readings of reactivity meter using the solutions of adjoint problems. For examples of measurements of emergency rods efficiency in VVER reactors it is shown that approach considering in the article is useful.

Key Words: safety justification, VVER, reactivity, ionization chamber, current, simulation, measurement, adjoint function

UDC 621.039

Computational Modeling of Standard Transient and Emergency Modes of RP on Fast Neutrons

Vasekin V.N.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182

The non-stationary neutron-physical code of MFRK allowing to simulate dynamic processes in the core of reactor plant (RP) on fast neutrons taking into account delayed neutrons and feedbacks is presented. A method for solving the unsteady neutron transfer equation implemented in the code is presented. The results of computational modeling of a number of standard transient and emergency modes of RP on fast neutrons are presented.

Key words: neutron-physical code, modeling, dynamic processes, delayed neutrons, feedbacks.

UDC 621.039.51

Replacement of the Reflector Direct Calculation by Albedo Boundary Conditions

Bolsunov A.A., Zhukovsky R.A.,
JSC "VNIIAES", 25, Ferganskaya str., Moscow, 109507

The reflector in a full-scale three-dimensional neutron-physical calculation is replaced by albedo boundary conditions in the model for full-scale simulators working in real time. The analytical formulations for two groups albedos are carried out. Information concerning models running time is given. The effectiveness of the proposed methodology is evaluated.

Key Words: reflector, albedo, boundary conditions

UDC 621.039.5

New Version of the SUHAM-3D Code for Solving the 3D Stationary Neutron Transport Equation for Reactors with Square Lattice and its Verification

Boyarinov V.F.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq.,Moscow, 123182

The new version of the SUHAM-3D code based on the more accurate 3D finite-difference surface harmonics method equations with three transversal and two longitudinal trial matrices for two-stage calculation (cells—reactor) reactor with square lattice is described. Verification of SUHAM-3D code was carried out on five tests of the international benchmark C5G7.

Key Words: surface harmonics method, neutron transport equation, code system SUHAM-3D, verification.

UDC 621.039

Program Hortitsa-M. Determination of Core Power Distribution with In-Core Detectors

Skorokhodov D.N.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182

The development history, current state, main equations and algorithm of the program Hortitsa-M are described.

Key Words: Hortitsa code, in-core detector, power distribution, in-core instrumentation system, in-core monitoring system, power reconstruction.

UDC 621.039.51

Using the Software Package of Neutron-Physical Calculation of TREK-VVER for Simulation of Dynamic Processes in Simulators

Bolsunov A.A., Golosova I.A., Karpov S.A., Samoilov A.A., Fedorov I.V.,
JSC "VNIIAES", 25, Ferganskay str., Moscow, 109507,
Pryanichnikov A.V.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182

The experience of using the software complex neutron-physical calculation TREK in the full-scale simulators of VVER-type reactors is given.

Key Words: neutron-physical calculation, simulator.

UDC 621.039.5

The Diffusion Model Application for the Calculation of the Radionuclide Release from Fuel

Babaytsev V.N., Geraskin I.N., Krayushkin A.V., Smirnova A.K.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182.

The modification of the diffusion model for taking into account radionuclide release from uranium dioxide through internal interstice is discussed. The procedure of the diffusion coefficient temperature dependence parameters obtaining on the base of experimental data is presented. The results of the model verification and some results of the calculations for RBMK fuel are given.

Key Words: diffusion model, uranium dioxide, radionuclide release.

UDC 621.039.5

The Use of Thorium in a Nuclear Power System with Thermal and Fast Neutron Reactors

Bobrov E.A., Andrianova E.A., Blandinskiy V.Yu., Teplov P.S., Gurin A.V.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182.

It is considered the concept of a fast neutron reactor with a sodium coolant, with metallic U—Pu fuel in the core and metallic uranium and thorium in blankets. The achievement of the required system characteristics for the start-up load and excess operating time is demonstrated. Several scenarios for the development of a two-component nuclear power system in Russia based on VVER-type thermal reactors and fast reactors with metallic fuel involving thorium resources have been considered.

Key Words: thorium, fast neutron reactor, two-component nuclear power system, uranium-plutonium metallic fuel.

UDC 621.039.52

Floating Power Units with RITM-200M RP

Petrunin V.V., Fadeev Yu.P., Pakhomov A.N., Veshnyakov K.B., Polunichev V.I., Kabin S.V., Turusov A.Yu.,
JSC "Afrikantov OKBM", 15, Burnakovsky Proyezd, Nizhny Novgorod, 603074

Two variants of floating power units with unified RITM-200M reactor plants are presented: optimized variant of the floating power unit "Akademik Lomonosov", which is under construction, and innovative self-propelled ship for supply of electricity, which will be transferred to the consumer via underwater cables. Main advantages of the both variants determining their economic efficiency and competitiveness compared with the unit under construction are increased electric power and duration of operation without refueling. To achieve these characteristics an innovative cassette type core similar to the RITM-200 RP core with elongated FA active part and increased number of FAs is applied in the design.

Key Words: floating power unit, reactor plant, core, operating time, safety systems.

UDC 621.039.58

The Research of the Behavior of Volatile Forms of Iodine in Reactor VVER-1000 Primary Coolant

Zaharov A.S., Nagel N.N.,
NRC "Kurchatov Institute", 1, Akademika Kurchatova sq., Moscow, 123182,
Rodionov S.A., Cicer A.A.,
Kalinin NPP, Udomlya, 171841

Studies of the behavior of various forms of iodine in the primary coolant of the third block of the Kalinin NPP were carried out at the experimental facility developed at the Kurchatov Institute. The release of iodine during heating of the coolant and its complete evaporation for the standard water-chemical conditions were analyzed.

Key Words: primary coolant, iodine, water chemistry conditions.