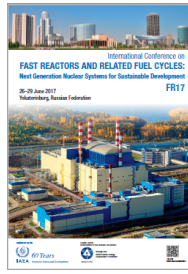


# International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



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## Codes of New Generation Developed for Breakthrough Project

*Wednesday, June 28, 2017 1:30 PM (20 minutes)*

In frame of Breakthrough project the system of codes of a new generation is being developing for justification of operational characteristics and safety of the NPP with sodium, lead and lead-bismuth coolants utilizing closed fuel cycle.

Use of the code system by design and industry organizations ensure reduction of uncertainties by the use of precise multi-scale models and more detailed geometry modeling and self consistent integrated analyses of nuclear reactors and fuel cycles.

Simulated objects include sodium (BN-600, BN-800, BN-1200, MBIR), lead (BREST-OD-300, BR-1200) and lead-bismuth (SVBR-100) reactors, NPP compartments and also objects of closed fuel cycle.

While building the system of new generation codes the attention is paid not only to the level of physical models but also to the realization of the modern technology of code development including effective use of high performance computation systems, contemporary code architectures and numeric schemes, etc.

Code system can be used during all stages of project development starting with the substantiation of design solutions up to probabilistic safety analyses of different levels, and building of training systems. To conduct PSA-1 the CRISS 5.3 code has been developed. For safety assessments including PSA-2 of NPP with fast reactors the EUCLID code has been developed as integrated performance and safety code for design justifications and safety analyses. It allows to model the behavior of different coolants and type of fuels.

RANS and LES CFD code LOGOS, and LES and DNS CONV-3D code, neutron-physical codes based on Monte-Carlo method MCU-FR and finite elements and discrete ordinates methods ODETTA have been developed for justification of designs. The BERKUT multi-scale code has been developed for mechanistic modelling of thermomechanical and physical-chemical behavior of oxide and nitride single fuel rod.

For PSA - 3 the system of codes for the spreading of radionuclides is realized consisting of several modules for the contamination areas in the regional scale (ROM) and site (ROUZ), in the water system (SIBILLA) and geological soils (GeRa).

The optimization of the technological processes of the closed fuel cycle (SNF reprocessing, nuclear fuel refabrication and radioactive waste management, including final disposal) the code VIZART is used.

In the presentation the short characteristics, status of development and verification and plans for future of the developing code system is presented.

### Country/Int. Organization

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