Contribution ID: **79**   Type: **ORAL**

Codes of new generation –sustainable platform for numerical modeling of installations in the Proryv project

Thursday 21 April 2022 10:40 (12 minutes)

Since 2010, domestically produced software required for design decision making and safety assessment of nuclear power plants with fast reactors has been developed in Russian Federation under "Proryv"project, namely, under one of its subprojects –Codes of New Generation.

As a priority, a task was set and successfully accomplished covering the development of 24 software products addressing various areas: neutronics (Monte-Carlo method –MCU-FR, kinetic approximation –CORNER, diffusion approximation –DOLCE VITA); thermal hydraulics (DNS and LES approach –CONV-3D, RANS and LES approach –LOGOS, channel approximation –HYDRA-IBRAE/LM); thermomechanics and fission products release from fuel rods (BERKUT-U); probabilistic safety analysis (CRISS 5.3); radiation effects of releases (outside the industrial site boundaries –ROM, within the industrial site boundaries –ROUZ, in freshwater bodies – SIBILLA); dynamics of soil and groundwater contamination due to radioactive and chemical substances migration (GeRa); modeling the balance of material and nuclide flows within closed nuclear fuel cycle (VIZART) and others. Special attention was given to the development of integral multiphysics codes for safety assessment of power units –EUCLID and radiation safety justification –COMPLEX. The state-of-the-art mathematical models and effective numerical algorithms are used in the codes. They are developed by cooperation of leading Russian research centers and can be effectively used both on personal computers and high-performance computing systems. The modern approaches to collective software development resulting in a significant improvement of software quality are applied in the process of code development.

By the end of 2020, TRL level of the developed software averaged to 8.5 (TRL level 9 suggests that Rostechnadzor certifies the software, as well as the code is put into production). Large-scale validation on experimental data obtained on operating reactor units (BOR-60, BN-600, BN-800), as well as on unique small-scale experiments focused on investigation of separate phenomena conducted recently in the Russian Federation can be considered as an undoubted advantage of the codes developed.

The codes of new generation are actively used for the safety assessment of nuclear facilities, to teach student in universities, to model benchmarks under IAEA CRP and are considered by other industries as a promising software allowing to address production tasks.

The contribution presents the basics for new generation code development and briefly overviews the state-of-the-art in their development, verification and validation, as well as the plans for their further evolution.

Country/Int. organization

Russian Federation

Authors: MOSUNOVA, Nastasia (Nuclear Safety Institute of the Russian Academy of Sciences (IBRAE RAN)); STRIZHOV, Valery (Nuclear Safety Institute); BOLSHOV, Leonid (Nuclear Safety Institute of the Russian Academy of Sciences)

Presenter: MOSUNOVA, Nastasia (Nuclear Safety Institute of the Russian Academy of Sciences (IBRAE RAN))

Session Classification: 6.3 Multiscale and Multiphysics Calculations

Track Classification: Track 6. Modelling, Simulations, and Digitilization