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KNOWLEDGE TRANSFER TO YOUNG GENERATION AND TECHNICAL RECONSTRUCTION OF BFS COMPLEX

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Youth Department of Russian Nuclear Society (YDRNS) was created at 21 November 1995

- **YDRNS** unites students, PhD students and young professionals working in various fields of nuclear science, energy and industry, as well as in related industries.

- **YDRNS has** more than 40 offices in enterprises and organizations which are engaged in scientific, educational and career guidance, promoting the transfer of knowledge and experience to the young generation and develop cooperation with nuclear energy professionals.

YDRNS activity

- 2015 year – 20-th annual conference of YDRNS “Youth and Future of Nuclear Society”, Obninsk;
- 2016 year – 21-th annual conference of YDRNS “Future of Nuclear energy”, Kurchatov, KurskNPP;
- Participation in organization of youth section during International scientific-technical conference “Safety, efficiency and economy of atomic energy”, Moscow;
- Participation in organization and development of WANO youth association
- YDRNS involved in supporting and transfer of relevant knowledge for the main organizations of nuclear industry including at the site of JSC "SSC RF - IPPE”

Fast critical facilities of the BFS complex

The BFS-1 facility was commissioned on June 19, 1961
The BFS-2 facility was commissioned on September 30, 1969

- Mock-ups of fast reactors.
- Mock-ups of reactors with other neutron spectra.
- Benchmarks for testing neutron data on new core materials, for justifying nuclear safety, for refining measurement techniques of neutronic parameters.

Mock-ups of domestic reactors such as IBR, BOR-60, BN-350, BN-600, BN-800 were studied at the BFS-1 and BFS-2 facilities.

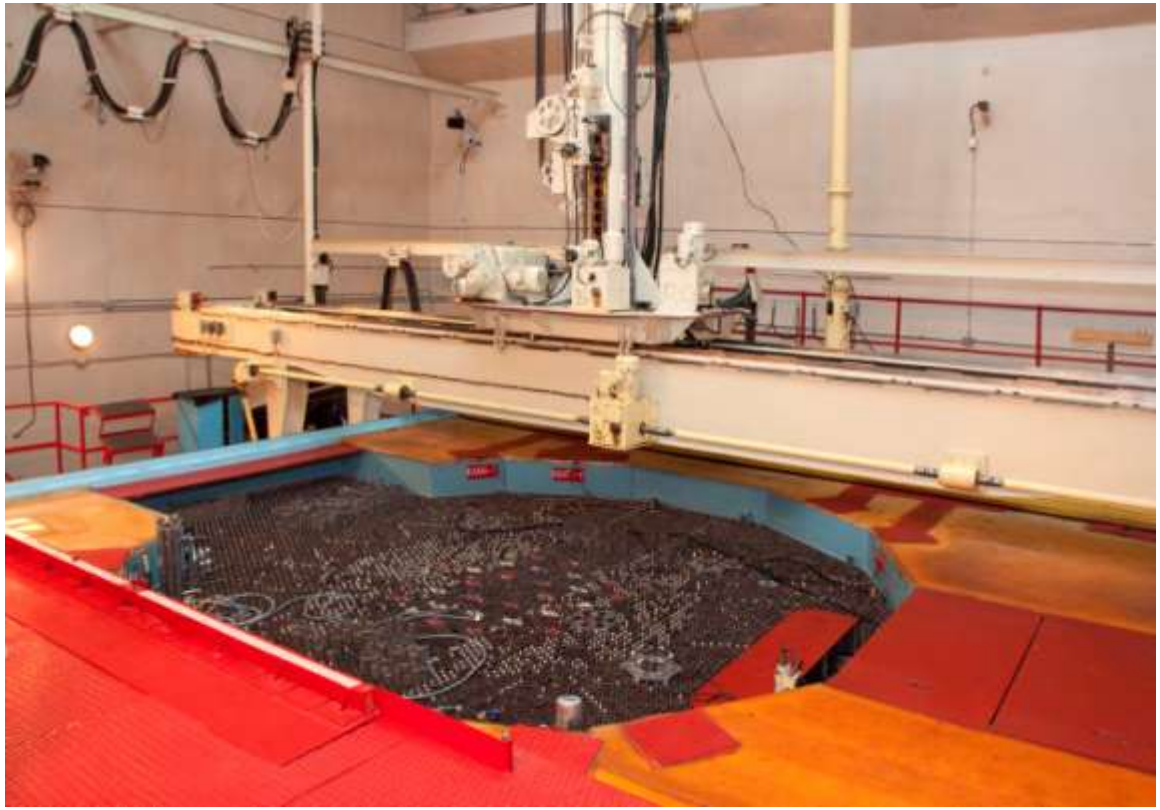
In recent years MBIR, SVBR, BREST, BN-1200 have been studied both on the mock-ups of the reactor cores and on specially made benchmarks.

BFS-1

BFS-1 is a critical facility for simulating fast reactor cores. The facility dimensions are as follows: the reactor vessel is 2 m in diameter, the fuel rods are 2,3 m in height.

BFS-2

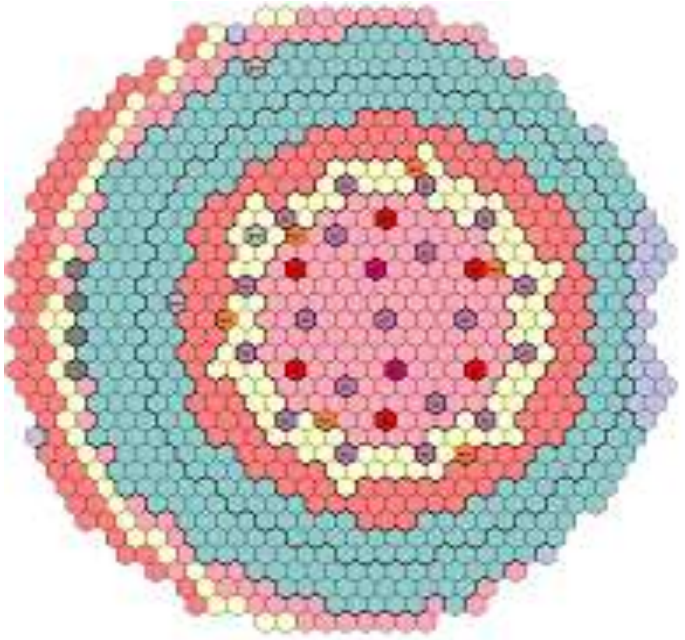
BFS-2 is the largest critical facility in the world; its dimensions (the vessel is 3m in height and 5m in diameter) allow full-scale simulation of up to 3000 MWe fast reactor cores and blankets, as well as in-vessel shielding and in-core storage.



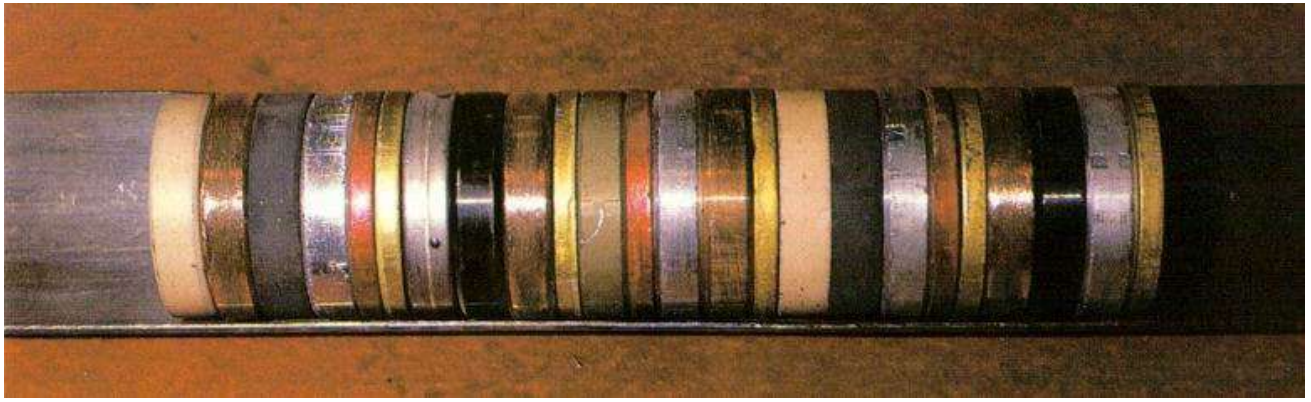
International experience

Over the past years (starting from the 1990-s) the BFS-1 and BFS-2 facilities have been used quite heavily for international cooperation which included:

- bilateral contracts with France, the USA, Japan, People's Republic of China, Korea, India regarding experiments in justification of the reactor facilities being developed, weapon-grade plutonium utilization, fuel cycle safety, transmutation of minor actinides, testing and introducing of the materials protection, control and accounting systems;



- contracts with ISTC (over 15 assemblies);
- the International Criticality Safety Benchmark Evaluation Project (12 assemblies, 43 configurations);
- the International Reactor Physics Experiment Evaluation Project (11 assemblies);
- international experiments for comparing the reactor parameter measurement techniques (foreign participants: Japan, France; critical assemblies besides BFS: MASURCA, FCA).



Major construction work

Replacement of different engineering systems of the BFS complex, including:

- The radiation monitoring system
- The self-sustaining reaction emergency alarm system
- The CPS equipment
- Supply system (new ventilation and electrical systems)
- Renovation of the personnel access hatch

The nuclear materials storage was reconstructed.

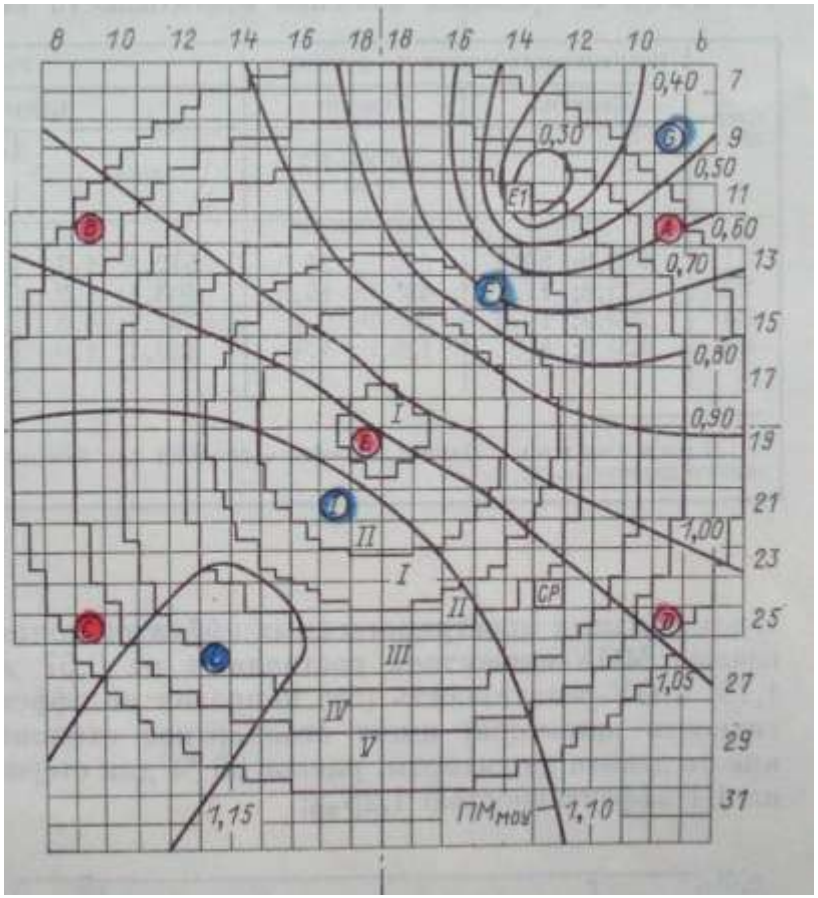
R&D

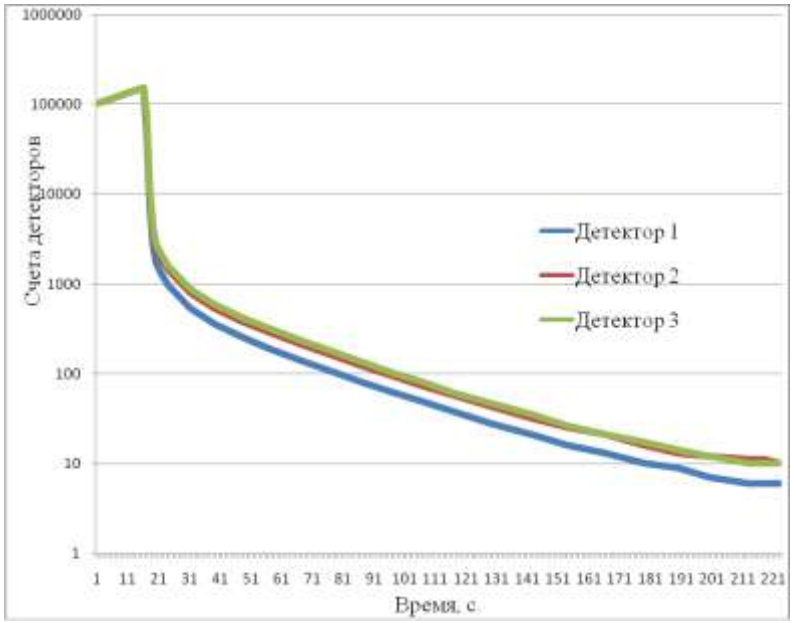
Technologies and equipment for manufacturing batches of disks were created as part of the done R&D:

- plutonium metal disks,
- depleted uranium mononitride disks (10 tones),
- Boron carbide (enrichment of B^{10} is 80%, 100 kg),
- More than 100 000 disks of metal sodium

Supercomputer

A supercomputer was bought for the BFS complex to solve the problem of improving the accuracy of experimental data





Outcome

The work done makes it possible to:

- obtain the necessary licenses
- simulate promising fast reactors on full scale
- take part in solving the problems of the closed fuel cycle
- improve working conditions

The BFS complex is ready to cope with a whole range of tasks, both within the scope of the Federal Target Program and in support of nuclear power development programs abroad.

Stages of retrofitting and upgrading (contd)

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Nuclear knowledge transfer at BFS complex

- Joint training program of JSC "SSC RF-IPPE“ and MEPhI (laboratory works for students)
- Employment about 10 young professionals over the past few years
- The participation of young professionals in various conferences in conjunction with YDRNS
- Refresher courses