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USSR and Russian fast reactor operation through the example of the BN600 reactor operating experience and peculiarities of the new generation BN800 reactor power unit commissioning

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The fast-neutron nuclear power industry development began with the BR-5/10 experimental reactors (1959) followed by BOR-60 (1969).

The power reactor evolution started with the BN350 commissioning in 1973. In 1980 the BN600 operating up to now was put into operation. In 2015 the BN800 obtained the first criticality.

BN600 fast reactor power unit No. 3 of 600 MW power has been put into operation in April 1980 and is under day-to-day operating conditions. Over the operating period the advantages of sodium-cooled fast reactor facility were highly appreciated. The complex tasks were also solved to improve safety and cost-effectiveness of the BN600 reactor facility.

Since the commissioning the BN600 reactor facility core has been upgraded three times and the main equipment lifetime has been significantly increased. The work has been carried out to extend the lifetime until 2020, as part of which it has been shown that the strength conditions in all the critical reactor components are not infringed for 45 years of operation.

After the events at Japanese Fukushima NPP the action plan aimed at greater resistance of the BN600 reactor facility against external impacts was put in practice.

Over the operating period the following were carried out at the BN600 reactor:

1. About 500 experimental fuel sub-assemblies were tested to study structural materials and designs of different types, which in particular allowed the fuel burn-up to be dramatically increased.
2. The technologies of repairs and replacement of the large reactor and steam generator components (72 heat exchangers of the steam generators, 3 low pressure cylinders, 6 feedwater pumps, 3 emergency feedwater pumps) were mastered.
3. The experience of the production of the high-specific activity isotopes was accumulated.
4. The long life tests of the large components operating in sodium were carried out.

The most important outcome of the operation is a justification of the construction of the new fast-neutron reactor power units (BN800, BN1200).

For 36 years of the safe and reliable operation the main task was fulfilled, i.e. the operation of the powerful unit with the sodium cooled fast reactor and sodium steam generators was mastered.

The BN800 was designed using inherent safety principles and applying an additional reactor shutdown system based on the passive operating principle.

Country/Int. Organization

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