



РОСАТОМ



ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

PANEL 1

Economics and Performance of Fast Neutron Systems

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Fast Reactor System Competitiveness

Global and country specific arguments:

- 1. What are the reasons?**
- 2. What to do?**
- 3. Technological background.**

Russian perspectives.

What are the reasons for FR systems?

Long term global and national perspectives. - NP based on FR system provides opportunities for sustainable energy supply with:

- **Efficient use of natural nuclear resources**
- **Effective SNF and nuclear waste management**
- **Non-proliferation**

Medium term (2030) country specific reasons for FR system development:

- **Increase NP capacity**
- **Address LWR SNF accumulation challenge**

Russian perspectives:

Long term – By 2050 we need about 100 GWe of NP.

- **Sustainability of NP can be achieved only on basis of FR system**

Medium term - By 2030 it is planned to increase NP capacity from present 23 GW(e) up to 50-60 GW(e). Challenges: Accumulation of VVER and RBMK SNF; Export of VVER with SNF take back policy.

FR system can help in :

- **Providing partially required increase in NP capacity**
- **Demonstrating effective way of LWR SNF management**
- **Demonstrating opportunities for institutional solutions of Pu non-proliferation**

What to do?

Long term perspective:

1. **Develop, demonstrate and commercialize all elements of FR system, including:**
 - NPP with FR (sodium; lead-bismuth; lead)
 - FR SNF reprocessing (aqueous; dry)
 - FR fuel fabrication (MOX; nitride; metal)
 - Effective MA management
2. **Introduce technological barriers and institutional measures to assure non-proliferation**

Medium term perspective: Russia

1. **Develop and demonstrate at industrial level key elements of FR system:**
 - NPP with FR – some 10 GWe BN type reactors
 - LWR and FR SNF reprocessing - RT-2 reprocessing plant advanced aqueous tech.
 - FR fuel fabrication – MOX fabrication plant for BN reactors
 - LWR MA management – Np recycling in BN; Minimization of Am accumulation
2. **Demonstrate institutional measures of non-proliferation assurance**
 - International center for LWR SNF management
3. **Develop and demonstrate innovative reactor and fuel cycle technologies**

Russian Background and Challenges for Medium Term FR System Development (1).

NPP with BN

- **Safe and economical operation of BN-600 , with specific capital cost about 40% higher than that of VVER-1000**
- **Allocated specific capital cost for BN-800 construction is only 20% higher than that of VVER-1000**
- **Estimated capital cost of FOAK commercial BN-1200 to be build before 2020 is about the same as that of VVER-1200**

Russian Experience in Development and Implementation of BN for NPP

Reactor	Development	Construction	Operation
BN-350	1960 - 1965	1965 - 1973	1973 -1998
BN-600	1963 - 1972	1972 - 1980	1980 - in operation
BN-800	1975 - 1983 2002 - 2004	Under construction	Planned for 2014
BN-1600	1980's	-	-
BN-1800	2002 - 2005	-	-
BN-1200	From 2006	-	Planned for 2020

Russian Background and Challenges for Medium Term FR System Development (2).

BN MOX fabrication

- **MOX fabrication technologies are demonstrated at experimental level.**

Challenge:

Develop an industrial level MOX fuel fabrication plant for BN reactors

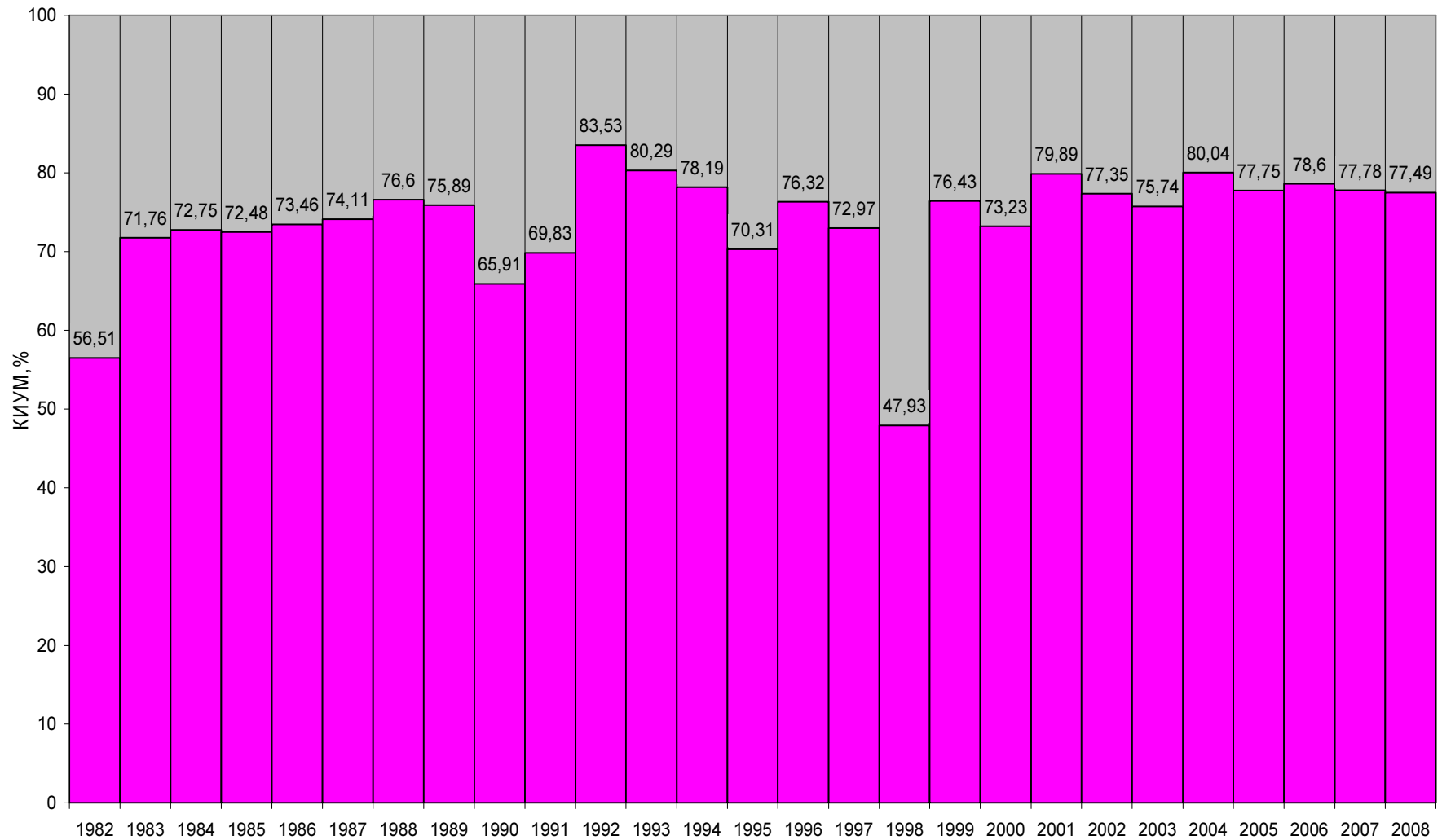
SNF reprocessing plant

- **RT-1 plant (aqueous technology) is reprocessing SNF from VVER-440 and BN-600**

Challenge:

Upgrade aqueous technology for use in RT-2 plant to meet environmental requirements and to effectively reprocess SNF from VVER-1000, RBMK and BN-1200

BN-600 Load Factor (1982-2008)



View of the BN- 800 Construction Site (BNPP, 10.2009)



vessel bottom

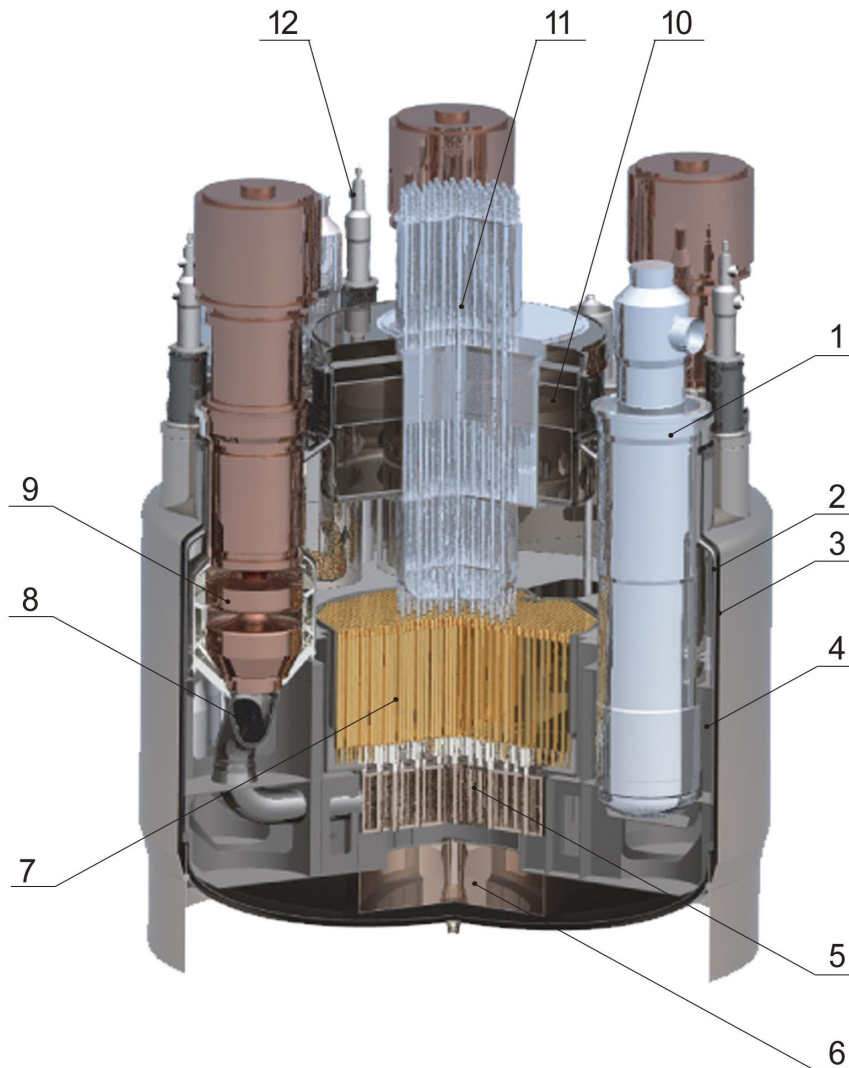


Vessel bottom



Strongback

BN-1200 Reactor Unit



- 2 Main vessel**
- 3 Safety vessel**
- 4 Strongback**
- 5 Core diagrid**
- 6 Core debris tray**
- 7 Core**
- 8 Pressure pipeline**
- 9 MCP**
- 10 Rotating plugs**
- 11 CRDM**
- 12 FA reloading mechanism**



**Our motto:
Steady progress in practical
implementation
is
the pledge of success**

Thank you