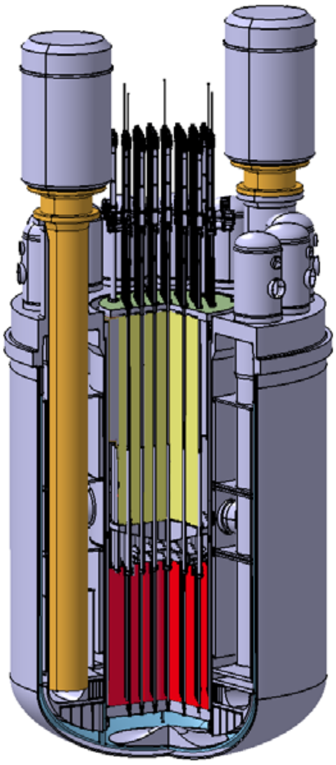
АКМЭ
Атомные Комплексы
для Малой и средней
Энергетики

SVBR-100:
New Generation Nuclear Power Plants for Small and Medium-Sized Power Applications



With growing interest in distributed generation as a sustainable and effective alternative to traditional centralized energy systems new small modular nuclear power complexes are considered one of the most reliable and affordable solutions for meeting growing energy demands.

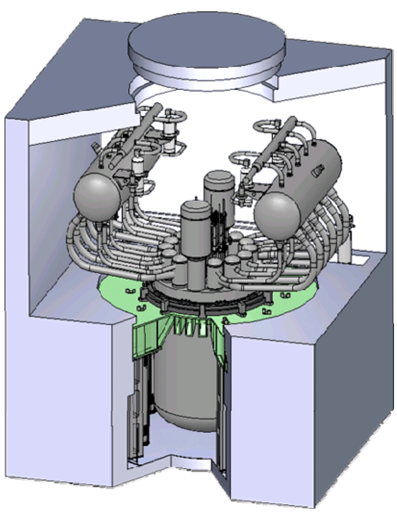
Small nuclear complexes can provide electricity, heat supply and desalinated water to remote residential settlements, electricity and steam supply to industrial complexes, and can be used for replacement of aging fossil and large nuclear sites.

Key challenges for small nuclear complexes are enhanced level of safety and reliability, a load following capability, operational and maintenance simplicity, and economical efficiency.

All these challenges are solved in 100-600 MWe multi-modular nuclear power complexes based on the SVBR-100 reactor module – an integral 100 MWe lead-bismuth fast reactor with inherent safety and high proliferation resistance features.

Proven Performance and Leading Technology Expertise

SVBR-100 design is developed through the expertise and knowledge of leading Russian



Single SVBR-100 module in its containment

nuclear research and design institutes: Institute for Physics and Power Engineering (IPPE) and JSC OKB "Gidropress".

The design is based on more than 80 reactor-years operational experience of Pb-Bi cooled reactors for propulsion applications.

The SVBR supply chain involves leading technological, engineering and manufacturing expertise of Russian nuclear industry integrated by JSC "AKME-engineering" - a 50/50 joint venture of the State Russian Atomic Corporation "Rosatom" and private partner En+ Group.

SVBR-100 Reactor Modules – Generation IV Nuclear Systems

SVBR-100 design meets the Generation IV innovative nuclear systems key requirements.

Sustainability:

- ✓ Minimal environmental impact: reduced quantities of spent fuel due to long fuel campaign (with UO_2 fuel)
- ✓ Possibility to work in closed nuclear fuel cycle systems: SVBR-100 module can operate in the fuel self-sufficient mode (with mixed oxide uranium-plutonium fuel)

Safety and Reliability:

- ✓ Inert to water and air lead-bismuth coolant with very high boiling temperature (1670 ^{o}C)
- ✓ Integral nuclear system design without high pressure in primary circuit
- ✓ Passive safety systems
- ✓ Any radiological emergency possible for SVBR reactor could not lead to radioactive emissions into the atmosphere
- ✓ No hydrogen is released during SVBR operation
- ✓ Reduced "single-shaft" risk (through larger number of small units)

Improved Resistance to the Nuclear Fissile Material Proliferation:

- ✓ Absence of breeding blankets, where weapons-grade plutonium can be accumulated
- ✓ Use of uranium with enrichment below 20% (if uranium oxide fuel is used)
- ✓ Lower possibility of accessing fuel during the core lifetime due to long fuel campaign (up to 7-8 years) without refueling

Economical Efficiency through Construction and Operation Simplicity:

- ✓ Factory-made ready-for-installation reactor module transportable by rail way, road or waterway
- ✓ Flexibility for local energy needs due to scalable modular design (100-200-300-400-500-600 MWe)
- ✓ Possibility of deployment near residential area (less than 1 km)
- ✓ Relative ease of system integration (fewer requirements imposed by local infrastructure)
- ✓ Broad range of products: electricity, heat, desalinated water, steam for industrial needs
- ✓ Availability of servicing infrastructure for operation, maintenance, refueling and spent fuel treatment, and decommissioning services
- ✓ Simplicity of power plant management due to plant lifecycle (6D) model
- ✓ Fuel universality: reactor core can be loaded with almost all types of nuclear fuel (UO_2, MOX and other fuel types)
- ✓ 60 years lifetime for reactor vessel and structures
- ✓ Compliance with an existing regulatory framework
- ✓ Public acceptance due to high safety characteristics

SVBR-100 Power Plant Specifications

Reactor thermal output	280 MW(th)
Power plant output with one reactor module:	
Electricity	101 MW(e)
Process steam*	580 tons/hour, saturated steam, p=6.7MPa, T~282.9°C
Municipal heat*	max. 70 Gkal/hour
Desalinated water*	max. 200 000 tons/day
Design load factor	90%
Fuel campaign duration	7-8 years (for UO2 fuel with 16.3% enrichment)
Load following capability	0.5-2% per minute in 70-100% power range
Reactor module weight	270 ton
Reactor module dimensions	4.5 / 7.86 meters (diameter/height)
Overnight capital cost	$4000-4500 /kW(e)
Generating costs**	$40-50 /MWh

**- if appropriate equipment is installed*
*** - incl. O&M, fuel, decommissioning costs*

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