Russian nuclear energy program: expectations to SMR designs

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Since 2010, National Research Centre “Kurchatov Institute” reports directly to the Government of the Russian Federation.

The Centre’s tasks include elaboration of “the concept of development and the scientific & technical basis of nuclear energy and fuel cycle”
The project of SMR construction on the basis of ship reactors KLT-40S is now close to completion. Its basic purpose is practical testing and demonstration of optimal choice of solutions for small nuclear plants. This floating unit was launched at the Baltic Plant site in June 2010. Unit completion, including equipment assembling and commissioning, is expected before 2012.
OKBM Afrikantov has developed a detailed design of RITM-200 reactor facility (36 MWe) for floating NPPs and the new-generation universal icebreaker with variable draught (10.5–8 m). RITM-200 continuous operation period makes 26 000 hours (compared with 8000 hours for nuclear facilities of icebreakers currently in service).
SVBR-100 – fast neutron reactor with lead-bismuth coolant

Industrial power unit with fast neutron reactor and lead-bismuth coolant, developed on modular basis (100 MWe per module). Can operate on uranium oxide fuel or MOX. Is based on Russian submarine experience. Commissioning scheduled after 2017.
Fast neutron reactor with lead coolant

Development of this reactor design was launched to confirm the alternative fast neutron reactor technology with lead coolant. Construction of 300 MWe pilot unit is scheduled for 2020.
Megawatt nuclear power facility for space applications

Development of this propelling module (target date – 2017) is based on the nuclear power facility of megawatt class with high-temperature gas-cooled fast neutron reactor and electric jet engines. It is intended for future far space exploration programs, such as: missions to planets, expedition to Mars, bases on the Moon, etc.
Use of VVER technology for medium-sized reactors

The capacity range for this reactor category based on LWRs includes two development lines: using traditional VVER configuration and using the experience and technology from shipbuilding industry. A two-loop VVER-600 is being developed on the basis of VVER-1200 circuit; units are also offered with VBER reactors (200 to 600 MWe) based on the standard 100 MWe module.

- Use of developed ship reactor technology: operation experience over 6000 reactor years
- Guaranteed safety: use of AST developments
- Use of VVER operation experience
- Maximum use of AES-2006 development experience

VBER-600 (OKBM)  
VVER-600 (OKB Gidropress) (AES-2006/2)
Small land-based and floating NPPs with pressurized water reactors ABV (6 MWe per unit) were also proposed. Intentions are known to deploy several ABV plants in Eastern Siberia.
A nuclear turbogenerator facility with pressurized water reactor – SHELFF – is proposed on the basis of operating prototypes. This facility would be serviced in a “visiting” mode. It is intended as energy supply for oil and gas production in Arctic seas.
Technological content of Russia’s nuclear energy program

- Increasing VVER-based capacities;
- Introducing fast breeder reactors in the nuclear energy system, with practical implementation of the closed nuclear fuel cycle;
- Introducing nuclear capacities in energy-intensive branches of industry and municipal sector;
- Developing a system of medium-sized NPPs;
- Developing small nuclear power plants for local and regional energy supplies.
Joint Kurchatov-Harvard report:
Promoting Safe, Secure and Peaceful Growth of Nuclear Energy:
Next Steps for Russia and the United States

Under consideration is the idea of a multinational consortium to supply factory-built reactors possessing high intrinsic safety, security and proliferation resistance levels.

This project should be based on extensive international cooperation allowing the participating countries to contribute their best scientific, technological and industrial achievements, as well as all necessary natural and financial resources, to this project.
Medium and small NPP development tasks

• To develop concepts and select promising designs of medium-sized NPPs for Russian and world markets; to identify the frames of competitiveness as concerns supplying energy to Russia and to countries developing nuclear power.

• To construct reference medium-sized power units based on different reactor technologies in various regions of Russia.

• To create floating, transportable and land-based pilot small-sized NPP units for local and regional energy supply, using different reactor technologies.

• To create adequate infrastructure for small-sized NPP construction, operation and maintenance, aiming to supply energy to remote and hardly-accessible regions and industrial sites.