



LEAD STORY

## World's Number One

**The global nuclear power industry witnessed a historic event in late February as the world's first Generation 3+ reactor was commissioned at the Novovoronezh II nuclear power plant. Russia is not alone in constructing Generation 3+ reactors, but Rosatom is ahead of the game after putting its reactor in commercial operation. You will find more about the advantages of the new reactor technology in this Rosatom Newsletter.**

Last August, the VVER-1200 reactor at Unit 1 of Novovoronezh II was for the first time connected to the national power grid and began power generation. By the time the power unit was put in commercial operation, it had passed all the necessary tests and generated 1,691 million kWh of electricity. Its compliance with the project design, technical standards and statutory regulations, including power efficiency

requirements, was certified by Russia's Federal Service for Environmental, Technological and Nuclear Supervision (Rostechnadzor). "I am thankful to the Novovoronezh staff for their commitment to putting the reactor unit in operation and all the hard work they have done to prepare documents for the submission to Rostechnadzor," said Vladimir Povarov, Director of the Novovoronezh Nuclear Plant.

### **Better than others**

Novovoronezh II Unit 1 with the VVER-1200 reactor incorporates the AES-2006 design featuring a number of definitive advantages over the VVER-1000 reactor design. In particular, it provides for a 20% higher power capacity and a doubled service life (60 vs. 30 years) of its core components, a reactor vessel and a steam generator body. More important is that the new design is fully compliant with the post-Fukushima safety requirements. The Russian AES-2006 design features an array of unparalleled safety systems. One of them is a core catcher, a unique safety device designed by Russian nuclear

engineers to mitigate effects of a nuclear meltdown. Structurally, it has a cone-shaped body installed at the bottom of the reactor pit. In case of an accident, the core catcher medium mixes with the molten core materials and distributes them evenly inside the catcher body. The catcher can hold the molten core for an unlimited period of time, preventing nuclear materials from getting outside. The first ever core catcher was installed at the Russian-designed Tianwan Nuclear Power Plant in China.

Another advantage of the new design is the use of uranium gadolinium oxide fuel to enhance physical parameters of the nuclear reactor core. The possibility of using conventional fuel still exists, though. As compared to VVER-1000 reactors, the AES-2006 design features new monitoring and diagnostic systems for the equipment, primary loop piping and valves. The design also incorporates improved reactor core radiation and neutron monitoring systems. And finally, the new design provides for reduced downtime and improved capacity utilization, which is expected to reach 92%.

### **No human involvement**

Passive heat removal is another unparalleled safety feature of the AES-2006 design. This technology allows for cooling of the reactor core in case of power outage without human involvement. The system adopts a natural circulation principle where an outdoor air (coolant) is sucked in by heat exchangers, then heats up and rises to the exhaust header on the top of the dome to be released into the atmosphere.

### **Financial benefits**

New safety systems, increased service life of the primary equipment and improved automation solutions significantly reducing the need for manpower will almost double the cost efficiency of

Novovoronezh II. "It should be noted that such outstanding cost efficiency is not achieved at the expense of safety. On the contrary, all the safety parameters are dramatically enhanced. At present, no one is surprised by a large number of safety systems. Good news is that there is a rising trend after the Fukushima disaster towards self-contained passive systems requiring no power or human control. Much progress has been made both in Russia and abroad in the development of such systems. It is worth mentioning that several systems are Russian know-how, particularly the core catcher, making the Russian design more attractive for customers and providing Rosatom with undeniable advantages in its effort to expand the portfolio of international nuclear construction contracts," said Alexei Mayorov, First Deputy Chairman of the Federation Council Committee for Economic Policy. No environmental impact

According to the environmental impact assessment, the commissioning of Novovoronezh II will not affect the environment. The new site is located in the Kashirskoe District of the Voronezh Region, only 900 meters away from the Novovoronezh nuclear plant. Over 80% of the territory is arable land, with the Don River flowing nearby. Comprehensive environmental surveys have been regularly conducted here since 1994.

### **FOR REFERENCE**

Novovoronezh II was designed to replace the obsolete Novovoronezh nuclear power plant, the oldest commercial nuclear station built in the USSR. Construction of the Novovoronezh NPP began in 1958. The first power unit was brought online in 1964, with the other four units put in operation in 1969, 1971, 1972 and 1980 respectively. Three out of five reactors have been shut down by now and are in the process of decommissioning.

**EXPERT COMMENT: Denis Kravchenko, Deputy Chairman of the Parliamentary Committee for Economic Policy, Industry, Innovative Development and Entrepreneurship:** *“The most advanced Unit with a Generation 3+ VVER-1200 reactor was put in commercial operation at the Novovoronezh Nuclear Power Plant. This is undoubtedly a huge milestone in the nuclear industry development. It proves that the industry keeps evolving, and our designers and engineers continue to hone their craft. And our position on the international market becomes more influential.”*

## COOPERATION

# Russia and Tajikistan to Cooperate in Nuclear

**The countries signed an agreement on civil nuclear cooperation during the visit of Russia's President Vladimir Putin to Tajikistan in late February.**

This is the first document in the history of the two countries to establish a legal framework for nuclear cooperation between them. The document was signed by Rosatom CEO Alexei Likhachov on behalf of the Russian government and Farhod Rakhimov, President of the Tajikistan Academy of Sciences, on behalf of Tajikistan's government.

Areas of prospective cooperation are extremely diverse and include design, construction, operation and decommissioning of research reactors, spent nuclear fuel and radioactive waste management, reclamation of uranium tailing dumps, and disposal of decommissioned uranium extraction and processing facilities. Cooperation between the countries will be also focused on radioisotope production, the use of nuclear technology in the industry, medicine and agriculture, and professional workforce training for the nuclear power industry. The nuclear



power development has long been on the national agenda in Tajikistan. The country has been an IAEA member since 2000 and is an active participant in international meetings, forums and other events dedicated to peaceful uses of nuclear power. Last year, Tajikistan launched a program to restore the Argus-FTI nuclear research reactor in 2016–2020. The reactor was designed by Soviet scientists, but has never been put in operation after the Chernobyl disaster. According to Ivan Andrievsky, Chairman of the Board of 2K Engineering Company, the research reactor is the most likely site for joint nuclear projects between Russia and Tajikistan. “Tajikistan plans to revitalize the project and will need Rosatom’s competencies in this field,” he said.

### **Reclamation of Taboshar**

One of the most important joint projects is reclamation of tailing dumps and dumping grounds of the beneficiation plant near the town of Taboshar. This project is part of an international program focusing on the rehabilitation of former uranium production sites. The program was developed to mitigate



environmental impacts of uranium tailing dumps in Kazakhstan, Kyrgyzstan, Russia and Tajikistan.

Launched on 1 January 2013, the program is coordinated by Rosatom. The national project owner in Tajikistan is the Ministry of Industry and New Technology of the Republic of Tajikistan. Phase 1 of the project is carried out by the Federal Center for Nuclear and Radiation Safety (FCNRS), a subsidiary of Rosatom. In accordance with the program, FCNRS has conducted engineering and environmental surveys, updated the geological and hydrological parameters of the area, and performed land surveying on the Taboshar site. In November, FCNRS submitted design documents and cost estimates of the Taboshar site reclamation project to the government of the Republic of Tajikistan for examination.

Not long ago, Tajikistan's ministers and Andrei Golinei, CEO of FCNRS, had a

meeting on the Taboshar reclamation project. They discussed an approval procedure for the buffer zone borders and expert examination of the project documents submitted to the Committee for Architecture on 30 November. Hochien Mirsoshokir, Deputy CEO for Science, Environment and New Technology of the state-owned company Tajredmet, is sure that the submission of project design documents to the Committee for Architecture is an important step that speaks for their soonest approval. "Official examination of the project design will be a starting point for the massive effort of bringing the Taboshar site back to radiation safety," he said.

**Vladimir Putin, President of the Russian Federation:** "The civil nuclear cooperation agreement we have signed today opens up new opportunities for joint projects in this field. I should say that this agreement is first of all a solution to environmental problems."

## EVENTS



## Rosatom Takes Part in EXPO 2017

**In late February, Rosatom took part in the 3rd International Participants' Meeting in the margins of EXPO 2017 International Exhibition.**

Astana EXPO 2017 International Exhibition in Kazakhstan is a major global scale event. Entitled 'Energy of the

Future', the exhibition is naturally focused on the concept of green energy. It will run for 93 days and present the best green energy solutions from all over the world. Leading global experts will discuss how to make green energy affordable, eco-friendly and cost efficient so that it becomes a major development trend in the energy industry for the coming decades. Vicente Loscertales, Secretary General of the Bureau International des Expositions (BIE), appreciated the level of EXPO 2017, expressing confidence in the exhibition's success.

### **Nuclear and beyond**

A sponsor of the exhibition, the state-owned Russian nuclear corporation Rosatom will also present its nuclear technologies in the Russia pavilion organized by the Russian Ministry of Industry and Trade. Themed Russia as the Planet's Energy Potential, the pavilion's

design is centered on the Arctic and Lake Baikal, particularly development of natural resources in Russia's North with advanced technologies.

According to Rosatom International Network, the Russian exposition will feature Rosatom's major projects crucial for the development of the Arctic region. These include Russia's icebreaker fleet and floating nuclear power plant (FNPP). Additionally, Rosatom plans to present projects that might be of interest for its international customers and contractors. Options are diverse and include small-scale nuclear generation, wind energy, nuclear research technology, small hydropower plants, nuclear medicine and MultiD technologies. Rosatom will also be present in the pavilion of Kazatomprom, Kazakhstan's national uranium operator.

## **What is in store for exhibitors?**

Kazakhstan's authorities have established the Integrated Service Center to provide visa support, tax, banking, insurance and other services. A dedicated system helps to speed up the accreditation process greatly. A village with 1,374 apartments was built around the EXPO site to accommodate commissioners of the national pavilions, their families and staff. For the convenience of international visitors, Kazakhstan has allowed citizens of 45 countries to travel visa-free.

## **COMMENT**

**Vitaly Dragunov, Head of Rosatom Central Asia:**

"The theme of the exhibition – Energy of the Future – is best suited for presenting Rosatom's prime product – safe and state-of-the-art energy technology notable for both its environmental and economic efficiency. Rosatom is known as a global nuclear industry leader and the world's only company to offer a line of products that spans across the entire value chain of the nuclear power industry.

However, it is not only our latest achievements in nuclear energy industry – from uranium extraction to nuclear decommissioning – that we are going to show. As you know, Rosatom also provides small hydro generation solutions, such as containerized small hydro plants, and intends to build a plant to manufacture wind generators. Rosatom is a company that offers equipment and solutions for a vast range of industries, including thermal and hydro power industry, petrochemistry, medicine, agriculture, water treatment and others. We would like to discuss all of these aspects at the Energy of the Future forum, which is going to be a cornerstone of EXPO 2017.

Rosatom is a sponsor of Astana EXPO 2017 and an exponent at Russia's national pavilion that will host a special nuclear-themed week. Plans are afoot to create a dedicated nuclear energy pavilion at EXPO in collaboration with Kazatomprom.

Russia and Kazakhstan have a long track-record of close cooperation in the nuclear energy industry and nuclear technology. Rosatom's recent achievements in fast breeder development owe much to the construction and safe operation of the BN-350 reactor in Aktau (Kazakhstan) in the Soviet era. It was at this site where the first nuclear-powered desalination plant was put in operation. Being the most powerful in those times, the plant was supplying the city with fresh water. Kazakhstan's cities of Alatau and Kurchatov have operating research reactors designed by Soviet nuclear engineers. Fuel for these reactors is supplied by Rosatom. Today, we are working together with Kazakhstan on uranium extraction and enrichment. Rosatom Central Asia, whose head office is based in Astana, identifies and evaluates promising areas for cooperation with Kazakhstan's public and private

companies, investments and formation of joint ventures. All this allows for unleashing the full potential of the country's industry.

It is noteworthy that Russia's and Kazakhstan's companies do their business

within the single Eurasian economic and customs territory. This is why broader cooperation between them opens up new opportunities, and joint solutions we propose might be applicable in other countries as well."

## IN BRIEF

### **Main assembly works completed at Rostov-4**

On 3 March 2017 at 17.00 in reactor building of Rostov NPP's power unit No 4 under construction nuclear specialists have started one of the most important processes in NPP construction – a cleanout to the open reactor of primary systems.

This is the operation from which we can start a countdown to power unit start-up. Before the cleanout Rostov NPP Plant Manager thanked all the fixers, adjusters, operating personnel who provided the execution of one of the key pre-commissioning events within the target time frame. "In fact, this is the end of assembly works and the start of major pre-commissioning works at power unit No 4", Andrey Salnikov said. The cleanout process to the open reactor is executed by the personnel of operating power unit of Rostov NPP and the specialists who carried out the assembly of the systems, it will continue for 40 days. It is planned to

put Rostov NPP's power unit No 4 into operation in 2017.

### **Latvian and Estonian Companies to Take Part in Hanhikivi-1 Project**

Titan-2 has subcontracted AS BMGS Eesti filiaal to construct the marine diversion canal a temporary dam, excavate the spillway pit and build a canal levee. The operations will start this spring and are scheduled for completion in the spring of 2018. AS BMGS Eesti filiaal is an Estonia-based division of Latvia's BMGS, a civil and hydraulic engineering specialist. At the end of the last year, Titan-2 signed contracts with Latvia's UAB Profileksas for the construction of temporary housing for 2,600 people and Estonia's AS MARU Ehitus for the plant's medical center and administrative buildings for Titan-2 and Hanhikivi's general supplier RAOS Project.