

## LEAD STORY



## Alexei Likhachev: Russia Leads in Fast Reactor Technology

**The future of nuclear energy cannot be separated from fast neutron reactors and closed nuclear fuel cycle. This was underlined in the speech made by Rosatom's CEO Alexei Likhachev at the 61st IAEA General Conference. Read more from the IAEA Conference in our report.**

"We are convinced that the future of nuclear energy cannot be separated from fast neutron reactors and closed nuclear fuel cycle. Today Russia is a leader in this field. We are building a multi-purpose fast breeder reactor in Dimitrovgrad. In

Seversk, we are running the Breakthrough Project, an ambitious pilot center comprising fast neutron reactors and facilities for MOX fuel fabrication and spent fuel reprocessing," Rosatom's CEO said.

Russia has long been in the forefront of fast neutron technologies. As you remember, a BN-800 fast neutron reactor was launched last year at the Beloyarsk nuclear power plant to mark a new milestone for the industry. With BN-600 and BN-800 online, Russia is the world's only country operating commercial fast neutron reactors. A more powerful BN-1200 reactor has been designed, and experts are now looking into economic aspects of the project.

### **Challenges to nuclear**

Speaking at the conference, Alexei Likhachev mentioned current strategic challenges faced by the global nuclear

industry, among them energy poverty, global inequality in access to power and the planet's ecosystem at risk of irreversible collapse. "We can only address these challenges by expanding and simultaneously changing the global energy mix," Mr. Likhachev stressed. "We need to cut down on hydrocarbons as much as possible. This is our responsibility towards generations to come."

### **Biocapacity of global forests**

According to Alexei Likhachev, the nuclear industry makes a large contribution to the Earth's ecosystem. "If all operating nuclear stations with a total capacity of 392 GW were coal or gas fired, they would add some 2 billion tons of CO<sub>2</sub> to global emissions. All forests in the world absorb 2.5 billion tons of carbon dioxide yearly. In other words, nuclear plants are comparable to the biocapacity of all forests on the Earth in terms of positive environmental effects!" Mr. Likhachev said.

He pointed out that the future belonged to green energy. "Solar, wind, water and nuclear supplement and strengthen each other. They should be those four pillars that will support the future non-carbon energy mix," Likhachev explained.

Citing the IAEA forecast, he said that the share of green energy would exceed 80% of total power generation by 2050. With this goal in the plan, the installed capacity of nuclear power plants should reach to 930 GW globally. This means that in just ten years we will have to commission over 20 GW of new and replacement capacity every year.

"This goal is ambitious, yet attainable. It depends entirely on us – the countries that have opted for nuclear – whether it is achieved. We are not competitors with other non-carbon sources of power as all

green energies are part of the solution to the world's climate change problem. But we need to reach a new level of cooperation within the international nuclear community," Alexei Likhachev stressed.

### **Putting safety on top**

According to Alexei Likhachev, Russia supports the IAEA Secretariat's policy of tightening regulations on nuclear safety. "We are ready to back up the policy with our competencies and resources," said Mr. Likhachev. Safety improvement principles are embedded in Generation 3+ reactor designs, he said, with inherently safe reactors of the fourth generation to appear in the future.

### **Improving attitude towards nuclear power**

Improvement of the public attitude towards nuclear power is another area of cooperation with the IAEA, Likhachev said. "We respect any decision of every country on whether to embark on nuclear. It is important that the decision is based on scientific knowledge, not a phobia. We need to convince the public, politicians, scientists and experts that nuclear is clean, safe and efficient," Rosatom's CEO explained. According to him, Russia and other countries where Rosatom is building reactors strive to continuously improve public acceptance of nuclear energy. "We are ready to share our experience in this field. The joint approach needs to be formalized at the upcoming IAEA Ministerial Conference in Abu Dhabi," Likhachev stressed.

"The global nuclear industry can and should unlock the technological leadership potential and become a major participant in the fourth industrial revolution," he said.



## IAEA to strengthen ties with Russia

The International Atomic Energy Agency intends to strengthen its ties with Russia

in the field of nuclear energy, said IAEA Director General Yukiya Amano when visiting Rosatom's exhibition stand in the Vienna International Centre. According to Mr. Amano, Russia is a very important partner of the IAEA, an active member of the nuclear community, and a recognized leader in fast neutron technologies. "The IAEA will continue its partnership with Russia by expanding it into new fields of nuclear energy," said Yukiya Amano after visiting Rosatom's exhibition where Russia presented its most innovative solutions within the framework of the 61st IAEA General Conference.

## EXPANSION

### Nuclear Center in Bolivia: Contract Signed

The project to construct a nuclear research and technology center in El Alto (Bolivia) has entered a new stage. Rosatom and Bolivia signed a construction contract on the margins of the 61st IAEA General Conference.

The signed contract strengthens Rosatom's position on the global non-energy nuclear market, which has been exhibiting fast-paced growth recently. The contract was made between the Bolivian Atomic Energy Agency and the State Institute of Engineering Design (a Rosatom Group company). Signatories to the contract were Vyacheslav Galushkov, CEO of SIED, and Hortensia Jiménez Rivera, CEO of ABEN. The contract was signed in the presence of Rosatom's CEO Alexei Likhachev and Bolivia's Deputy Energy Minister Luis Alberto Echazú.

The project has no precedent in the global nuclear industry as the site selected by Bolivia for the nuclear center is the highest ever (4,000 meters above the sea level) to build a nuclear facility. The center will have a pressurized water



reactor with the rated capacity of 200 kW, a multi-purpose gamma irradiation unit, a cyclotron for nuclear pharmacy purposes, an engineering department, and several research laboratories. With over 300 million US dollars to be invested, the center will facilitate the use of radiation technologies in agriculture, medicine, industry and other areas.

### Integrated offering

Some of the center's facilities will be commissioned already in 2019. Its design life is 50 years, but can be extended when this limit is approached. Apart from constructing the center, Rosatom's integrated offering comprises research and engineering staff training, infrastructure development and maintenance services for the entire project life of the nuclear center. The Russian nuclear corporation will also support Bolivia in scientific research.

“Construction of this highest altitude nuclear research facility is not the only thing we offer Bolivia. Our partners always receive the latest technology. The project will make Bolivia a local leader in nuclear research. Earlier we concluded a contract for preliminary site surveys. The results we have obtained prove that the site is fully suitable for the construction. On-site work will begin very soon in cooperation with our Bolivian colleagues,” said Alexei Likhachev, CEO of Rosatom.

## FOR REFERENCE

*Operating in more than 50 countries worldwide, research reactors have been contributing to the development of innovations and education for over 50 years. At present, there are 245 operational research reactors in the world, including 58 units in Russia. Rosatom has built over 120 research reactors both in and outside Russia.*

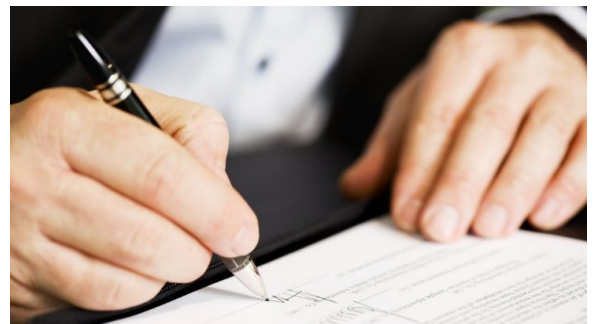
## COOPERATION

# Russia, Paraguay to Cooperate in Nuclear

**Rosatom is strengthening its positions in Latin America. Russia and Paraguay signed a nuclear cooperation agreement on the sidelines of the 61st IAEA General Conference.**

The agreement was signed by Rosatom’s CEO Alexei Likhachev and Cesar Jose Cardozo Roman, Executive Secretary of the National Radiological and Nuclear Regulatory Authority of Paraguay.

It is expected to facilitate a nuclear dialog between the countries and lay a foundation for joint projects in the field of nuclear energy. The signing of the agreement was preceded by a seminar held by Rusatom International Network in Asunción some time ago and dedicated to modern nuclear technologies and its applications. The seminar was attended by over 110 people. On 18 October 2016, Paraguay’s Radiological and Nuclear Regulatory Authority and Rosatom signed a memorandum of understanding on civil



nuclear cooperation. The memorandum was the first document signed by the two countries in this field to mark the beginning of joint work on nuclear projects.

The new document established a legal framework for civil nuclear cooperation between Russia and Paraguay in multiple areas, such as assistance in building and improving Paraguay’s nuclear infrastructure in line with global practices; radiological and nuclear safety regulation; security of nuclear materials, radiation sources, storage facilities and radioactive substances; management systems for nuclear materials, radioactive substances and waste registration; fundamental and applied nuclear research, fabrication of radioisotopes and their use in the industry, medicine and agriculture; cooperation in radiation



technologies and nuclear medicine; nuclear staff education and training.

To promote joint initiatives in these areas, the parties will form bilateral working groups. The memorandum also provides for expert exchange, seminars, conferences, assistance in education and training of academic and engineering staff, exchange of research and technology information, as well as

supplies of equipment, materials and components.

Paraguay has repeatedly shown interest in Russian nuclear technologies. The country is very much interested in the development of nuclear medicine which is now available only abroad, for example, in Brazil. As an exporter of agricultural products, Paraguay is also interested in irradiation solutions essential for boosting exports to Europe or the US

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## IN RBIEF

### **Yukiya Amano Reelected As IAEA Director General**

Yukiya Amano was appointed as Director General of the International Atomic Energy Agency (IAEA) for the third four-year term. This was announced on Monday at the 61st IAEA General Conference. In March, the IAEA Board of Governors resolved to appoint Mr. Amano, whose powers of the General Director would expire in late November, for the third term. The 70-year-old Japanese diplomat will continue running the office of the IAEA Administration Head from 1 December 2017 till 30 November 2021. It was the IAEA General Conference where the nominee for Director General should be first approved. Mr. Amano has been heading the IAEA since December 2009. The second term of his office expires in December 2017. In January 2017, Mr. Amano decided to apply for the third term of the same office.

### **Rosatom and Kazakhstan's Ministry of Energy Agreed on Cooperation**

The parties signed two documents on nuclear cooperation at the 61st IAEA General Conference held in Vienna on 19

September. The first document is a protocol to the Nuclear Ammunition Disposal Cooperation and Settlement Agreement signed by Russia and Kazakhstan on 20 January 1995. This document formalizes successful completion of the world's largest disarmament project. Following implementation of the agreement, nearly 500 tons of weapons-grade uranium from Russian and Kazakh nuclear ammunitions was converted to civil uranium. The protocol provides for mutual procedures to regulate project-related financial settlements. The second document is the Russian-Kazakh Agreement on Cooperation in Nuclear Power Research and Development. This agreement is predetermined by historical ties between Russia and Kazakhstan in nuclear energy, and extensive potential offered by these ties. Its goal is to facilitate the advancement of Russian-Kazakh cooperation in the civil nuclear industry.

### **IAEA, Rosatom to Join Site Restoration Efforts in Central Asia**

The International Atomic Energy Agency and Rosatom signed practical arrangements to jointly remediate and restore uranium legacy sites in Central

Asia. The document was signed by Nikolai Spassky, Deputy CEO of Rosatom, and Juan Carlos Lentijo, IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security. The practical arrangements aim at intensifying joint efforts of Rosatom and the IAEA in the restoration of legacy uranium production sites in the Republic of Tajikistan and Kyrgyzstan. In particular, the document provides for joint revision of legacy site remediation solutions and site survey results, follow-up activities, and development of multi-lateral project strategies.

## **HEU fuel moved out from the research reactor in Kazakhstan**

The last batch of highly enriched uranium (HEU) fuel of the research reactor VVR-K was moved out to Russia. The reactor is

situated in the Nuclear Physics Institute (NPI, Almaty, Kazakhstan). The fuel was delivered to Koltsovo Airport (Yekaterinburg) by air and then moved by road to the reprocessing facility at PA Mayak. The shipment was organized by the research and production company Sosny. The decision to convert VVR-K from highly enriched to low enriched (LEU) fuel (19.7% with regard to uranium-235) was made in 2003 as part of the international program to convert research reactor cores to low enriched fuel. In 2011, NCCP jointly with A. A. Bochvar VNIINM and NIKIET started series production of LEU fuel for this reactor. By present, NCCP has delivered to NPI four batches of LEU fuel; the latest one was delivered in August 2017. Experts estimate that this fuel would last for 15-18 years.