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NEW BUILD

Deal Struck

Russia and Uzbekistan signed an intergovernmental agreement on cooperation in NPP construction in Uzbekistan.

Prime ministers of Russia and Uzbekistan, Dmitri Medvedev and Abdulla Aripov, signed an agreement on cooperation in construction of a two-unit VVER-1200V based nuclear power plant (NPP) in the Republic of Uzbekistan.

According to the document, the parties will work jointly on the design, construction, commissioning and operation of the nuclear power plant.

"Site surveys are already underway. Due to its strategic nature, the project lays a foundation for decades-long high tech partnerships between the two countries. It will facilitate technology transfer and development of local staff competencies in multiple areas. This will bring Uzbekistan up to a fairly new level of technological development," Dmitri Medvedev said.

Uzbekistan's decision to build a nuclear plant was announced by Rosatom Director General Alexey Likhachev in late May 2018 after talks with President Shavkat Mirziyoyev. In July, the Head of the State held a meeting to discuss the formation of the national nuclear industry. The Government was tasked to develop a regulatory framework for the emerging industry, study best practices in nuclear construction, select a site for the nuclear plant, and establish a department that would be responsible for the construction and subsequent operation of the plant. The facility is planned to be put in operation before 2028.

The nuclear partnership is rooted in the framework agreement on peaceful uses of nuclear energy. It was signed on December 29, 2017 to highlight promising areas of cooperation, including national nuclear

infrastructure, staff training, construction and life cycle maintenance of nuclear plants and research reactors, exploration of natural resources, development of uranium deposits, rehabilitation of uranium tailing dumps, fabrication of radioisotopes for industry, medicine and agriculture, as well as applied and fundamental research. The framework agreement provides for academic exchange, establishment of specific project teams, and organization of conferences and workshops.

As part of the academic exchange initiative, students from Uzbekistan started their first course in Russian universities. At the National Nuclear Research University (MEPhI), students are already studying Nuclear Physics and Technology, with 12 of them seeking a bachelor's degree and three admitted to the master's program. They will have an opportunity to intern at operational nuclear plants in Russia. A branch campus of the National University of Science and Technology (MISiS) has been opened in Uzbekistan. A branch campus of the National Nuclear Research University (MEPhI) is due to open in 2019.

By Land and Water

The last large-sized component was delivered to the construction site of Leningrad-II NPP Unit 2.

The last piece of oversized equipment for the Leningrad-II Unit 2 reactor building, a vehicle airlock, was delivered from Tyazhmash, Russia's heavy equipment manufacturer, to the port of Sosnovy Bor, a town near Saint Petersburg.

The airlock was transported by land and water. "It traveled a total of 2,100 km. We used a designated lowboy trailer and a river barge to transport the airlock," said Igor Voronin, a representative of Russia's freight carrier Sovfracht. "The route from Syzran to Sosnovy Bor ran along the Volga River to Lake Onega and the Gulf of Finland and took 26 days. The weather was favorable, and we delivered the airlock to Sosnovy Bor safely and on schedule."

The vehicle airlock is a safety system designed to cut off the reactor zone from the clean zone. It is used to move fresh nuclear fuel into, and spent fuel and nuclear waste out of, the reactor building, as well as take maintenance machinery and equipment in and out of the reactor zone.

After the airlock was delivered to the port, it was transported further to the construction site to undergo the incoming inspection procedure. "After the ramp is ready and the crane is installed, the airlock will be emplaced at Level +26.00 into the round opening between the internal and external containments and welded to the metals embedded in the concrete containment walls. We plan to take this important step early next year," said Andrei Korpachev, Senior Engineer from the Technical Supervision Department of Leningrad-II.

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MBIR Basket Welding Completed

A major welding task was completed at the multi-purpose fast breeder research reactor (MBIR).

The welding of a core basket shell and a reactor pressure vessel for MBIR was completed at Atommash (a subsidiary of Rosatom's AEM Technologies). The welded seam is more than six meters long and 22 mm deep.

The core basket will be installed inside the reactor vessel and is designed to separate inward and outward coolant flows in MBIR, cool down the reactor vessel and vessel internals, and fix other components inside the vessel. Weighing 45 tons, the core basket is more than five meters high and three meters in diameter. Atommash will manufacture 14 components for the reactor, including vessel supports and structural elements with the total weight of over 360 tons.

For reference:

The multi-purpose fast breeder research reactor (MBIR) is constructed at the Research Institute of Atomic Reactors (RIAR) in Dimitrovgrad (Ulyanovsk Region, Russia) to become the most powerful of all research reactors in operation, under construction or under design in the world. The construction is to be completed by 2020. MBIR will replace the BOR-60 fast breeder reactor that is approaching the end of its service life. The sodium-cooled reactor has a thermal capacity of 150 MW and a service life of 50 years.

MBIR's unparalleled specifications allow solving a broad variety of research tasks within shorter time periods, including research into performance and safety of fast breeder reactors as part of the closed nuclear fuel cycle. The reactor will be accessible for international research teams.

EDUCATION

Studying the Atom

Rosatom and ITC signed a joint memorandum.

In late August, Rosatom Southeast Asia and the Institute of Technology of Cambodia (ITC) signed a memorandum of understanding to facilitate joint programs in nuclear research and education.

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The parties agreed to develop partnerships between ITC, Russian universities and Rosatom's research organizations. ITC will provide a basis for a nuclear information center to be established in Cambodia.

"Nuclear science and technology are essential components of the national strategy. Apart from energy production, nuclear technology is used in medicine, agriculture and other important industries," said Dr. Om Romny, Director General of ITC.

For reference:

Founded in 1964, the Institute of Technology of Cambodia (ITC) had eight departments and 4,942 students as of August 2018.

The memorandum was signed in connection with last year's framework agreement on peaceful uses of nuclear power. The document provides the legal basis for bilateral cooperation in nuclear education and staff training, fundamental and applied research, use of irradiation technologies in industry, medicine, agriculture and environmental protection. It also opens up prospects for long-term projects, such as the construction of Russian-designed nuclear reactors in Cambodia.

PROCUREMENT

Link in Chain

Rosatom shared its best procurement practices at the World Nuclear Association Symposium.

In September, London hosted a meeting of nuclear supply chain management experts in the run-up to the WNA Symposium. The meeting was attended by representatives of Rosatom's procurement, supply management and quality assurance departments.

Leading global vendors, equipment manufacturers and nuclear operators discussed the possibility of establishing a certification system for industry suppliers. Its goal is to bring together key nuclear industry stakeholders to establish, operate and control

a system to certify nuclear power equipment manufacturers to ISO 19443, a new standard that contains specific requirements for the application of ISO 9001:2015 by organizations in the supply chain of the nuclear energy sector supplying products and services important to nuclear safety (ITNS).

The meeting participants also discussed a number of matters related to supply chain management, quality assurance and anti-counterfeiting initiatives. As part of the discussion, Rosatom's representatives spoke about how the proprietary procurement system of the Russian nuclear corporation improved quality assurance and minimized risks of receiving poor quality products.

"Rosatom procures most products through competitive bidding, and any supplier may take part in it," says Dmitri Vashurkin, Deputy Director for QA at Rosatom. **"It is extremely important to ensure that all procured goods and services are compliant with the specifications, including quality and safety requirements. This is why we have developed a comprehensive procurement management system designed to prevent delivery of low-quality products and restrict access of unscrupulous suppliers and contractors."**

The company has adopted a set of regulatory documents containing 22 requirements for suppliers, purchase and sale contracts, and contract execution. The key of these requirements assure that suppliers have necessary expertise, competencies and resources. **"We at Rosatom have an opportunity to request information about suppliers' previous performance and available production facilities, and carry out an audit to verify information provided by suppliers,"** Dmitri Vashurkin added.

According to him, quality assurance does not end after a supplier was selected. Rosatom also has the opportunity to control key events during performance of the contract.

Automation of the inconsistency management process is another effective quality assurance tool. This inconsistency management system accumulates Rosatom's best practices in identifying and preventing defects in products throughout the project life cycle. NL

For reference:

The World Nuclear Association Symposium is an annual event bringing together global nuclear industry leaders and nuclear energy professionals. Traditionally, working group meetings are organized a few days in advance of this premier event to discuss the most important issues in the nuclear industry. Over 700 professionals from 30 countries took part in the WNA Symposium this year.

MARKETING

Towards New Industry

RIN President presented the Center for Nuclear Science and Technology (CNST) project to Azerbaijani partners.

Construction of a CNST can be a starting point for nuclear industry development in Azerbaijan. This was announced by Alexander Merten, President of Rusatom

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International Network (RIN) at the international conference entitled “Energy of the Future: Challenges and Opportunities”. The conference was held in Baku, the capital of Azerbaijan, on September 11–12, 2018.

Speaking at the conference, Alexander Merten noted that nuclear was the foundation for a low-carbon economy and explained the versatility of nuclear technology.

The plan to construct CNST has been approved by the Government of Azerbaijan.

CNST can be used to fabricate isotopes for medical and industrial applications, sterilize medical equipment, and irradiate foods and agricultural produce to extend their shelf life and protect against pests. **“CNST is a driver of research and technological development, a basis of nuclear infrastructure, and a doorway to the entire range of nuclear products and services,”** Alexander Merten said.

Rosatom’s subsidiary also presented an integrated offer for the construction of large-scale nuclear power plants.

For reference:

Rusatom International Network is a Rosatom Group company founded in 2014 to promote Russian nuclear products and services on the global market.

Centres for Nuclear Science and Technology (CNSTs) are complex scientific & commercial facilities and laboratories built around a research reactor. CNST projects are scalable and applicable across a wide variety of geographical contexts. For many newcomer countries, they can be a first stepping stone in developing national nuclear programs. CNSTs serve as platforms for developing the science and technology sector, enhancing the educational system and increasing the country’s innovative potential. Ultimately, these institutions have the capabilities to transform local economies, address developmental challenges and foster the skills and expertise necessary for further development of the nuclear industry.

URANIUM

TENEX and IAEA Agree on Transit for LEU Bank

Rosatom’s TENEX and IAEA have concluded a contract for transportation of low-enriched uranium (LEU).

The document was signed by Oleg Kozin, Deputy CEO for Logistics at TENEX, and Mark Bassett, IAEA LEU Bank Executive, on September 17 at the 62nd IAEA General Conference.

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According to the contract, TENEX will provide a full range of logistics services for transportation of low-enriched uranium and equipment through Russian territory to and from the IAEA LEU Bank in Kazakhstan.

For reference:

The IAEA Low Enriched Uranium Bank is a physical reserve of up to 90 tons of LEU created in the premises of the Ulba Metallurgical Plant (Kazakhstan) as part of the IAEA's efforts to provide nuclear fuel backup to countries in case the existing arrangements for LEU purchase are disrupted due to exceptional circumstances. The operations of the IAEA LEU Bank are meant to maintain the stability of the commercial uranium market. IAEA member states are allowed to purchase LEU from the IAEA LEU Bank only if they have signed a comprehensive safeguards agreement with the IAEA and fulfill its provisions.

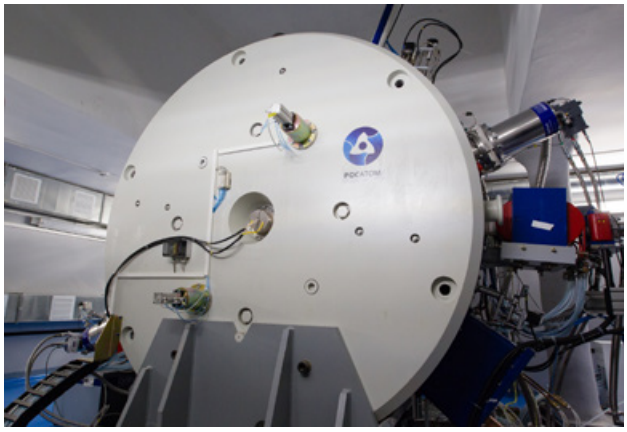
TENEX is a 100% Rosatom subsidiary. The company is a key global supplier of nuclear fuel cycle products and satisfies a significant share of enriched uranium demand from Western-designed nuclear reactors. Since 2015, TENEX has been acting as an industry integrator for international sales of back-end products and services (e.g. spent nuclear fuel and radioactive waste management, nuclear decommissioning).

HEALTHCARE

Nuclear Medicine for Malaysia

Rusatom Healthcare (Rosatom's nuclear medicine subsidiary) and Asian American Medical Group (AAMG) have agreed to cooperate in developing a nuclear medical center in Johor Bahru, Malaysia.

The relevant Memorandum of Understanding was signed on September 19 at the 9th Session of the High-Level Russia-Singapore Inter-Governmental Commission in Singapore.



"Both parties confirmed their interest in joint development of a health center which is expected to include radionuclide diagnostics and therapy departments, an electron beam therapy department, and a cyclotron and radiochemical unit," says the Rosatom statement.

In April, the Singapore-based AAMG announced its plans to set up the Tunku Laksamana Cancer Center, an advanced

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cancer treatment center in Malaysia's state of Johor. The project has received strong support from His Majesty Sultan Ibrahim Ibni Almarhum Sultan Iskandar, the Sultan of Johor.

The Memorandum was signed by Dato' Dr. Tan Kai Chah, Executive Chairman of AAMG, and Egor Simonov, Director of Rosatom South East Asia, acting on behalf of Rusatom Healthcare.

"Nuclear medicine for diagnosing and treating cancer sufferers has become increasingly popular in Southeast Asia in recent years. The proposed nuclear medicine center, which can serve patients from Malaysia as well as the neighboring Singapore, can position Johor as a leading medical destination with the best oncological care in the region," Dato' Dr. Tan Tan Kai Chah said.

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"Rusatom Healthcare's expertise in nuclear medical technologies will ensure the center offers state-of-the-art healthcare services in cancer treatment, research and education," Egor Simonov assured. NL

For reference:

The Singapore-based Asian American Medical Group was established in 1994 and has been listed on the Australian Securities Exchange since September 2009. The Group's operations include the Asian American Liver Centre Pte Ltd (AALC) and the Asian American Radiation Oncology Pte Ltd (AARO).

Rusatom Healthcare, a 100% Rosatom subsidiary, provides a full range of services in nuclear medicine, from facility construction and operation to supplies of isotopes worldwide.

TRENDS

Russian Nuclear at a Glance

Alexey Likhachev
Rosatom Director General

(Excerpts from the speech at the 62nd IAEA General Conference)

For years since its foundation, the IAEA has earned great respect as an organization able to address a wide range of civil nuclear issues. Russia has always supported and continues to closely cooperate with the IAEA. Specifically, we finance large technical cooperation projects, Nuclear Security Fund, Russia's Support Program to the IAEA safeguards, cancer treatment programs, INPRO (International Project on Innovative Nuclear Reactors and Fuel Cycles). Russia's contribution to the agency's budget exceeded 17 million euro in 2018. We place much importance on the IAEA's efforts in implementing safety guarantees. This part of the agency's work is essential for adherence to the NPT.

All the documents now developed and approved by the IAEA are the result of thorough discussion and consensus between the member states. We support such a professional and non-politicized approach used by the agency, its management and experts, and are certain that this approach will be preserved.

Nuclear energy is a sensitive industry. We have to deal with enormous amounts of energy. All projects we deliver in and outside Russia are meant to work for decades. This is

why it is critical for rapid global development of nuclear that the industry is safe from political impacts.

RUSSIA'S ACHIEVEMENTS IN NUCLEAR

Russia supports the statements made in the final document of the IAEA Ministerial Conference in Abu Dhabi. We are pleased that it has been confirmed that many countries regard nuclear power as a proven, clean, safe and cost-effective technology which will be of great importance to energy security and sustainable development in the 21st century.

Many goals have been achieved in the year since the previous General Conference. In the first quarter of this year, Russia has brought online and started the pilot operation of Unit 4 at Rostov NPP and Unit 1 at Leningrad II. This is the second Generation 3+ nuclear power unit we have started up.

In July, a landmark event took place in Murmansk as nuclear fuel loading began at Akademik Lomonosov, the world's first floating nuclear power station which will soon be transported along the Northern Sea Route to the city of Pevek. Small-size nuclear reactors are of great use to energy deficient regions where there is no necessary infrastructure and construction of large power generation facilities is unfeasible.

The new product we are offering is a floating nuclear power station based on RITM-200 reactors. Its capacity has been increased to 100 MW. In order to comply with the requests of our partners, we have also started developing a stationary reactor with the same specifications. As the world's first facility of its kind, our floating power station is creating a global trend for use of small-size reactors. In the years to come, this may usher in a whole new era of small-size and low-capacity reactors.

Russia continues to support nuclear power industry development in other countries. "First concrete" was poured at Turkey's Akkuyu, Roopur in Bangladesh, and one more power unit of India's Kudankulam. The active construction phase has started at Units 2 and 3 of Bushehr NPP. Construction operations are underway at Hanhikivi-1 in Finland, Paks II in Hungary, and the Belarus NPP. A set of documents has been signed with China. An agreement on construction of Uzbekistan's first nuclear power plant was signed very recently.

USEFUL RADIATION

Russia provides support to countries interested in non-energy use of nuclear technologies. We offer such countries our projects for construction of nuclear science and technology centers. The centers are meant for developing science, medicine and irradiation technologies for industry and agriculture. Rosatom has concluded contracts for construction of such centers with Bolivia and Zambia, maintains relevant cooperation with Vietnam, and is starting to work in this field with Nigeria and Mongolia (several agreements and memoranda have already been signed – Rosatom Newsletter).

SOLVING THE WASTE DISPOSAL PROBLEM

We regard efficient disposal of spent nuclear fuel as the main challenge of the near future. We are convinced that this can be achieved through a gradual transition to dual-component nuclear power systems with

closed nuclear fuel cycles. Russia already operates BN-600 and BN-800 sodium-cooled fast-breeders. In Seversk, we are running the Proryv Project, an ambitious pilot center comprising fast neutron reactors and facilities for MOX fuel fabrication and spent fuel reprocessing. Rosatom has developed the technology for production of mixed uranium plutonium nitride fuel, which is the best option for fast-breeders.

We also offer our partners SNF reprocessing services with introduction of uranium and plutonium in the fuel cycle and radioactive waste conditioning. All that activities ensure that, nuclear energy remain competitive for decades ahead.

GOALS FOR THE FUTURE

This spring, Rosatom held a large scientific conference in cooperation with Kurchatov Institute and Russia's Ministry of Education. Two main conclusions were made during the conference. The first one was that the key areas of development were hydrogen-based nuclear energy, plasma technologies, and controlled thermonuclear fusion. The second conclusion was that a major breakthrough in nuclear technologies could be ensured by bringing together pilot technologies and research infrastructure both in and outside of Russia. For this purpose, it is also necessary to consolidate professional competencies.

With this in mind, we welcome the 1st IAEA Ministerial Conference on Nuclear Science and Technology to be held in November, and intend to take part in the event. One of Russia's priority nuclear research projects is the international research center based on MBIR, a multipurpose fast-neutron research reactor which is now under construction in Dimitrovgrad. The reactor has been included in the list of facilities to be available for international use under the IAEA international research center program. NL

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