



Kudankulam Grows Bigger

In late June, a historic event took place at one of Rosatom's construction sites abroad as Russia started the second phase of the Kudankulam NPP construction project in India.

Kudankulam II comprises Units 3 and 4. On 29 June 2017, the first concrete was poured to form the foundation slab of Kudankulam Unit 3, marking the beginning of construction on the site of the nuclear power plant. "We intend to continue sharing our best practices with India and thus improve the country's energy security," Valery Limarenko, CEO of ASE Engineering, commented on the event. "The construction of Kudankulam with Russia's involvement is a flagship project. In late 2016 and early 2017, Rosatom completed the handover of Unit 1 to the customer; Unit 2 was transferred

to the Indian party for warranty operation. A special ceremony was organized to celebrate the two events and dedication of the power units to the people of India. And today we are beginning the construction of Units 3 and 4," Mr. Limarenko said.

"This moment – pouring of the first concrete – marks the starting point of the construction period set out in the contract. It signals the beginning of full-scale construction, installation of heating and electrical equipment, and equipment deliveries from Russia", said Andrei Lebedev, ASE Vice President for South Asia.

On 19 June 2017, India's Atomic Energy Regulatory Board (AERB) issued a permit for Nuclear Power Corporation of India Limited (NPCIL) to pour the first concrete on the site of Kudankulam Units 3 and 4. Civil nuclear energy is a key area of cooperation between Russia and India. The joint document entitled Strategic View of Promoting Russian-Indian Civil Nuclear Cooperation provides for construction of at least 12 Russian-

designed power units in India by 2020. Last month, ASE Group and NPCIL signed a general framework agreement on the construction of Kudankulam III in the Indian state of Tamil Nadu. The parties also signed an intergovernmental credit protocol. According to it, Russia will provide a loan to finance equipment deliveries and preparation of construction documents. The framework agreement provides for the construction of Units 5 and 6 based on the Russian design. These documents are necessary to kick off the construction of Kudankulam III as they define mutual obligations, costs and other material terms and conditions of the project.

About Kudankulam NPP

The Kudankulam Nuclear Power Plant is under construction in the Indian state of Tamil Nadu. Designed by AtomEnergoproekt, the facility consists of VVER-1000-based power units, which are fully compliant with relevant Russian and IAEA regulations and certified to the European Utility Requirements (EUR). The general contractor of the project is AtomStroyExport (ASE) that is responsible for feasibility analysis, equipment supplies and technical assistance. AtomEnergoproekt acts as the Project's general designer. India is represented in the project by Nuclear

Power Corporation of India Limited (NPCIL).

Alexei Pimenov, President of Rosatom South Asia:

"Kudankulam is one of the safest nuclear power plants in the world, with all post-Fukushima safety guidelines followed and safety systems working perfectly. Furthermore, a detailed design analysis of Units 1 and 2 let us conclude that they would withstand a Fukushima-like disaster. Their active and passive safety systems ensure an unparalleled safety level and allow for prevention of any anticipated problems in operation. These systems include a double containment, which protects the reactor internals and neutralizes external impacts, a passive heat removal system, a core catcher and a closed water intake system. The facility is also well protected from natural and man-made disasters, including earthquakes, tsunamis, tornadoes and even plane crashes. We also give much focus to environmental safety. For example, intake water from the sea passes through a 'bucket', a special reservoir that returns fish and plankton to their natural habitat. Kudankulam's tariffs on power generation are the most competitive in India and the entire region. Established by the Indian government back in 2010-2011, they have remained flat and not grown a bit since then. Power generated by Kudankulam costs only 4.10 Indian rupees per unit."

EVENTS

Kirill Komarov: We Launch One Project after Another

In late June, Rosatom took part in the ENSREG Conference on Nuclear Safety in Brussels.

The fourth conference held by the European Nuclear Safety Regulators Group (ENSREG) turned to be one of the key events for the European power industry. It brought together major



industry players from the EU countries, international organizations, and representatives of neighboring countries.

The conference was attended by almost 300 experts from around 30 countries, among them international experts, nuclear industry decision-makers and management of large energy companies. The aim of the conference was to provide an update on nuclear safety in Europe in a global context. The event addressed potential challenges for nuclear safety regulation, key recent developments in the EU policy (directives on nuclear safety, spent fuel and waste management, and basic safety standards) and emerging topics in the field of nuclear safety, such as long-term operation of nuclear facilities, prevention of irregularities, and supply chain control. It was not a highly technical event, but rather a forum to discuss topical issues of the nuclear sector with a wide range of stakeholders.

In his opening speech, Vice President of the European Commission Maroš Šefčovič stressed ENSREG's position on promotion of nuclear safety in the EU and the adjacent countries. "ENSREG will play a decisive role in implementation of nuclear safety directives and, among other things, provide advice on practical measures for improvement of nuclear safety in the EU. ENSREG is also fully engaged in providing expert reviews under the directives governing the operation of old nuclear power plants," Mr. Šefčovič said.

Safety as priority

Kirill Komarov, Rosatom's First Deputy CEO for International Business, stressed that the Russian company welcomed ENSREG's efforts in the promotion of nuclear safety in and outside the European Union. He also emphasized Rosatom's commitment to ensuring maximum security and radiation safety at nuclear facilities, and the need for developing international cooperation in this area. "It is beyond doubt that ambitious projects aimed at sustainable energy supplies in Russia and the EU and

environmental safety must be a matter of joint research and discussion. We are convinced that, alongside nuclear safety issues, environmental safety and sustainable development challenges now faced by the energy sector hold much promise as areas of cooperation," Mr. Komarov said. He also hoped that the joint EU-Russia working group on nuclear power would soon resume its activities.

No obstacles to cooperation

In his interview to RIA Novosti news agency, Kirill Komarov said Rosatom was ready to expand civil nuclear cooperation with the EU countries. "Today, I see absolutely no obstacles to cooperation between Russia and the EU in the nuclear power field. We have a long track record of successful cooperation that started 47 years ago and has never paused for a day. At present, our bilateral trade – I mean both shipments from Russia to the EU and vice versa, and our joint project in third countries – reaches billions of euros a year. This is a very successful and mutually beneficial cooperation, and we persistently develop and expand it. Things are evolving very rapidly, so we keep launching one project after another."

When asked about the impact of Brexit on the cooperation with Russia, Mr. Komarov replied that Russia and the UK had a necessary legal basis for cooperation, and it did not depend on whether the latter was in the EU or not. "The United Kingdom has long been supplied with nuclear fuel that is mostly manufactured in Russia, although under a license from France's Areva." Kirill Komarov also noted that Rosatom saw many opportunities to provide back end services, particularly nuclear decommissioning and fuel reprocessing, in the UK.

"Today much is discussed about how to build spent fuel repositories. Our strong

opinion is that the current state of technology allows for spent nuclear fuel to be thoroughly reprocessed prior to being put into storage. In other words, we can extract all reusable materials from the

fuel, and then dispose the remaining waste that will clearly have a smaller volume and a shorter half-life. This also provides common ground for cooperation with the UK and all EU countries.”



Nuclear Center for Vietnam

Increasingly more countries take interest in nuclear science and technology centers, Rosatom's new product. Following Bolivia and Zambia, the nuclear center will be built in Vietnam.

Rosatom and the Vietnamese Ministry of Science and Technology signed a memorandum of understanding late last month to construct a nuclear science and technology center in Vietnam. The memorandum was signed by Alexei Likhachev, CEO of Rosatom, and Tran Viet Thanh, Deputy Minister of Science and Technology of Vietnam. The parties expect the Center to become a starting ground for broader cooperation between

the countries. In particular, the plans are to work through the next steps to be taken after the Vietnamese government approves the project's preliminary feasibility study. The document also provides for consultations on the terms and conditions of project finance. The parties are going to work out a plan for further cooperation in the development of Vietnam's national nuclear infrastructure.

The agreement on cooperation in the construction of the nuclear science and technology center in Vietnam was signed in 2011, followed by a general framework agreement in 2014. The facility will feature a Russian-designed research reactor, a multi-purpose cyclotron, R&D laboratories, an engineering department, and equipment necessary to maintain safe operation of the center.

Huge benefits

A nuclear science and technology center is a perfect point for any country to start building the national nuclear infrastructure and make the first steps in the development of its civil nuclear program. The center creates an environment for theoretical and practical training programs facilitating further progress in the national nuclear industry

and relevant infrastructure. Such centers take much less time to be built than a nuclear power plant, but they are no less effective in raising public awareness of nuclear power and its benefits. Most customer countries have one thing in common: their nuclear infrastructure is at an early development stage. Therefore, nuclear science and technology centers lay an ideal foundation for the national nuclear program.

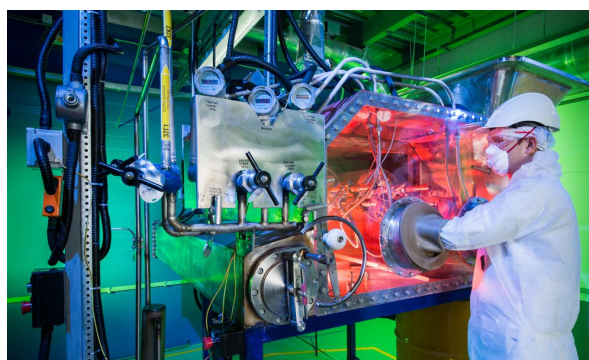
FUEL CYCLE

Rosatom Proposes to Create Radwaste Management System by 2025

Rosatom plans to complete the roll-out of the national radioactive waste management system by 2025.

The time to roll out Russia's integrated radioactive waste management system (RAWMS) can be extended by 4 years till 2025 due to construction times of certain facilities. The new plan has been drafted by Rosatom and filed with the Russian government for approval. The RAWMS is being established to ensure safe and cost efficient management and disposal of nuclear waste in Russia. The system will integrate a number of facilities involved in radioactive waste management and operating in strict compliance with relevant regulations.

The RAWMS establishment process is divided in three stages. At the first stage, a regulatory framework and administrative procedures were developed for the system, including the procedures for registration of radioactive waste and its location. At the second stage (ending in 2018), a low and medium level waste disposal system is being established. The third stage was expected to end in 2021



when a high level (the most hazardous) waste disposal system was planned to be completed.

High level radioactive waste is often left over after the spent nuclear fuel reprocessing. The plans for the third stage are to commission an underground laboratory in the Nizhnekansky granitoid massif (Krasnoyarsk Krai, Russia) by 1 January 2021. The laboratory will perform on-site surveys to confirm that the area is safe to build a high level radioactive waste repository scheduled to start operation in 2024. It is for this reason that the Government is proposed to extend the project's third stage till 1 January 2025.

FOR REFERENCE:

The underground laboratory is a unique research project. Its primary task is to study properties of the rock bed at a depth of 450–525 meters and, based on the study results, confirm that medium and high level long-lasting radioactive

waste can be ultimately disposed deep under the Nizhnekansky massif. The final results will be used to prepare a feasibility study of the repository and its commercial operation. The search for an ultimate disposal site for medium and high level radioactive waste has been conducted for the last 20 years. The facility is second to none in Russia as it

establishes perfect conditions for radioactive waste disposal and provides for high reliability of safety estimates. The rock massif will be surveyed without radioactive materials throughout the laboratory construction period and for at least 5 years until the final decision is made.

IN BRIEF

Electric Power Output by the Russian NPPs in 2017 exceeded 100 billion kilowatt-hours

In 2017, all Russian NPPs (the affiliate companies of the Rosenergoatom Concern) have jointly produced over 100 billion kilowatt-hours, with the total output as of June 26th being 100.040 billion kilowatt-hours (the Federal Antimonopoly Service's balance is exceeded by 3.163 billion kilowatt-hours).

It should be noted that this May the total electric power output of the nuclear power plants has increased by over 6.06% compared to the same period of 2016 reaching the balance of 16.108 billion kilowatt-hours. The installed capacity utilization factor since early 2017 has reached 85.5%. The Federal Antimonopoly Service (FAS) has approved a plan for the Russian NPPs to produce 199.8 billion kilowatt-hours of electric power in 2017. In 2016, the Russian NPPs have built up their joint output by almost one billion, up to 196.366 billion kilowatt-hours, thus surpassing the previous year's record of 195.213 billion kilowatt-hours.

Second International Compliance Audit Finished at Elemash

The integrated management system of Elemash (a subsidiary of Rosatom's TVEL Fuel Company) based in Elektrostal near Moscow has once again passed the audit by Germany's TÜV Thüringen and confirmed its compliance with ISO 9001, ISO 14001, ISO 50001 and OHSAS 18001 standards. The auditors inspected main production and auxiliary departments of the plant, including those where nuclear fuel is fabricated. "Positive results of the audit show that the management system at Elemash works efficiently and is being improved continuously," said Vladimir Kachalov, Head of the Audit Team. Elemash was the first plant in a series of similar audits at other subsidiaries of TVEL Fuel Company. The series is scheduled to be finished in September.