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# Sustainability by Numbers

**On October 1, Rosatom's Sustainability Report 2020 was published on the UN Global Compact website. Its most interesting feature is the last three years' statistics on sustainability performance and achievements.**

Rosatom joined the UN Global Compact in 2020. The current report is the first one to meet the UN initiative requirements.

The report shows that Rosatom makes a sizable contribution to the carbon-free environment in Russia and worldwide. In 2020, Russia produced 215.7 billion kWh of electricity, or 20.3% of the total power output, at its nuclear power plants. The figure is record high for the entire history of nuclear power in Russia and even the Soviet Union, which had more nuclear plants in operation. Every year, Russian nuclear power stations prevent 100 million tons of carbon dioxide emissions. Over 210 million tons of emissions is prevented by all Russian-designed nuclear power plants operating in the world.

For the last five years, the Russian nuclear corporation has been focusing its efforts on another carbon-free energy source — wind. Last year, Rosatom commissioned two wind farms, Adygea and Kochubeevskaya, the latter being Russia's largest wind farm. It is expected that Rosatom will account for 30% of wind generation in Russia by 2024. Meanwhile, green energy is finding a market with the consumers committed to making their products carbon-free. **"Rosatom has**

**signed an agreement with the Nestle Purina PetCare pet food factory on supplying 50 million kWh of electricity generated from wind energy. Since May 2020, the factory has been using renewable energy for all of its production operations,"** the report cites an example.

Hydrogen and energy storage are two other promising lines of energy business the Russian nuclear corporation is engaged in. They are expected to help transport and industry reduce their carbon footprint, balance out energy consumption and decrease losses. As for energy storage applications, Rosatom has established a dedicated division for this purpose. One of its projects completed in 2020 was the delivery of lithium-ion batteries for children go-karts.

Rosatom is also an operator of the Northern Sea Route and an owner of nuclear icebreakers. Apart from being the most powerful vessels, they keep northern seas and Arctic air clean.

Prevention of waste accumulation and removal of legacy waste are other important activities for Rosatom. **"In order to transition to closed-loop production, which is an important prerequisite for sustainable development, Rosatom is developing closed nuclear fuel cycle technologies and solutions for safe radioactive waste storage,"** the report says. Closed-loop production will bring the amount of spent nuclear fuel, which is already small enough, down to a minimum and can increase the use of natural uranium in the nuclear fuel cycle a hundred-fold.

The Russian government also tasked Rosatom with the rehabilitation of hazardous sites,

> **"Overall, Rosatom's operations contribute to the achievement of all 17 of the UN SDGs. However, given the scale of impact and the nature of the Corporation's business, the following Goals are of key importance: "Affordable and Clean Energy", "Decent Work and Economic Growth", "Industry, Innovation and Infrastructure", "Responsible Consumption and Production", "Climate Action", "Partnerships".**

such as Baikal Paper Mill, UsolyeKhimProm chemical plant (both located in the Irkutsk Region), a hazardous waste landfill site near Krasny Bor (Leningrad Region) and a landfill site near Chelyabinsk. **"The project involved the use of the world's best reference solutions for environmental remediation; it will help to reduce emissions within the city boundaries by 30%,"** the report points out. The rehabilitation of the Chelyabinsk landfill site was completed in September 2021. According to local residents, landfill smells have disappeared and do not bother them anymore.

Rosatom also works to promote nuclear medicine to achieve UN SDG 3 (Good Health and Wellbeing). The Russian nuclear corporation is a major global supplier of radioisotopes, with its market share ranging from 25% to 40% depending on the product.

## Effects calculated

The report contains information about the corporation's influence on the environment. In particular, pollutant emissions into the


atmosphere (excluding CO2) decreased from 38.6 thousand tons in 2019 to 38 thousand tons in 2020. CO2 emissions went down from 5.452 thousand tons in 2019 to 5.217 thousand tons in 2020. However, methane emissions increased from 193.7 tons to 766.6 tons over the same period, which is attributable to changes in the calculation methodology.

Although generation of nuclear energy is a key business for Rosatom, the nuclear corporation puts effort into not wasting it. With this in mind, an energy efficiency program was launched in 2018, with 2015 taken as a baseline. The target for 2020 was a 7% reduction, while the actual energy consumption decreased 9.84% (9.7% in 2019).

According to the report, the volume of water recycled and reused by Rosatom's organizations totaled 36.3 billion cubic meters in 2020 (35.097 billion cu m in 2019). The share of recycled water was 83.3% in 2020, up from 81.4% in 2019.

The total amount of waste at Rosatom increased from 24.782 million tons in 2019 to 30.926 million tons in 2020, but the share of recyclable waste grew, too — from 77.2% in 2019 to 79.9% in 2020.

**Caring for people**

**"ROSATOM provides optimal working conditions for its employees, with occupational hazards totally eliminated or exposure to such hazards not exceeding regulatory limits deemed safe for people. Organizations in the industry work systematically to improve safety performance,"** the report says.

Employee training is a daily routine at Rosatom. **"To provide employee training, Rosatom has established the Corporate Academy and the Technical Academy. Training includes online and distance learning. A total of 142,764 employees in the industry, or more than a half of Rosatom's total headcount, underwent training in 2020. The number of training hours per employee averaged 44.96 in 2020,"** the authors of the report point out.

**"We seek to make further progress in the sphere of sustainable development, improve our production processes, develop new products and contribute to climate action by developing low-carbon solutions for the electricity industry; we also implement a set of measures to make our product line more sustainable, as Rosatom's mission is to leverage high technology for the benefit of humanity,"** the report quotes Rosatom's Director General Alexey Likhachev as saying.

# Andreeva Bay Half Clean

**Rosatom updated Russian authorities, the public and international donors on its nuclear legacy management efforts at the spent fuel repository in Andreeva Bay. The most active contributor to the legacy management project is Norway, Russia's neighbor in the Barents Sea.**

In February 1982, a wall cracked in Building No. 5, a pool storage facility for spent fuel assemblies from nuclear submarines, at the Soviet naval base in Andreeva Bay, and radioactive water started to leak out. In the autumn of the same year, spent fuel assemblies were urgently unloaded from the pool into three underground blocks for storing liquid radioactive waste (2A, 2B and 3A), each being 15 meters in diameter and five meters deep. When the Ministry of Atomic Energy (later reorganized into Rosatom) was tasked with managing naval radioactive waste and spent nuclear fuel in 1998, it turned out that around 40% of the territory was contaminated. At some spots, the radiation levels were as high as 40 R/h, while the total activity reached 1.3 x 1017 Bq (3.516 mln Ci). There were more than 3,000 drums with 22,000 spent fuel assemblies and nearly 19,000 cubic meters of radioactive waste stored at the naval base in Andreeva Bay. **"We could not proceed with technical specifications and construction as we had to clean the area first,"** Anatoly Grigoriev, an international assistance project manager at Rosatom Center for International Radioactive Waste, Spent Nuclear Fuel and Nuclear Decommissioning Programs, describes the situation then.

A quarter of a century ago, the Norwegian government adopted its Nuclear Action Plan that focused, among other things, on cooperation with Russia. One of the projects provided for by the Action Plan seeks to decrease radioactivity in Andreeva Bay located close to the Norwegian border. First of all, Norway provided finance to divert subsurface waters from Building No. 5.

Then Norway was joined by Sweden, Finland, United States, France, UK and the Northern Dimension Environmental Partnership Fund to develop a feasibility study and an infrastructure plan for nuclear legacy management. The goal of the plan is to transport all the spent fuel assemblies to the reprocessing plant Mayak and decontaminate the area. The plan was adopted, and work started. Nearly USD 250 million was spent on the implementation of the plan.

A biological shield and a shelter were created for the blocks containing spent fuel assemblies. A cask storage site and a maintenance shop with a decontamination hall were built, and a berth reconstructed. A dedicated vessel, Rossita, was built to transport spent fuel assemblies and nuclear

waste. Engineers designed special robotic mechanisms and handling equipment. The robots are used to remove damaged assemblies from the bottom of the spent fuel pool in Building No. 5. Computer simulators were also developed for the operators to train how to hoist out radioactive debris from the blocks and load it into casks and containers. The containers were also developed specially for the project.

Today, nearly 77% of all spent fuel assemblies has been unloaded from Block 2A, and about 34% from Block 2B. The unloading and removal are expected to be completed in 2023. Damaged fuel assemblies will be removed by 2025.

The next plans are to build a radiation shelter, reinforce a foundation plate of the transformer substation, and upgrade on-site waste treatment facilities.

The most difficult but necessary task is to find a solution for Block 3A, which was filled with more than 7,000 damaged spent fuel assemblies in 1982. According to the plan, unloading will start in 2025. The removal of assemblies is expected to be completed in 2028.

**Timeline**

**1961** — Spent nuclear fuel repository put into service in Andreeva Bay

**1982** — Accident in the spent fuel pool (Building No. 5)

**1995** — Repository operations banned

**1998** — Ministry of Atomic Energy tasked with decommissioning of nuclear submarines and disposal of spent fuel; international consultations started

**1999** — Diversion of subsurface waters from Building No. 5

**2000** — SevRAO (Northwest Radioactive Waste Management Center) founded to deal with decommissioning of nuclear submarines and disposal of spent fuel

**2001** — Facilities in Andreeva Bay transferred to Ministry of Atomic Energy

**2006** — Start of construction works

**2010** — First batch of spent nuclear fuel removed from Block 2A

**2017** — Rossita's first run with the spent nuclear fuel unloaded from the pool

**2019** — Six damaged spent fuel assemblies removed from Building No. 5

**2021** — 50% of spent fuel assemblies removed

**2028 (plan)** — Removal of spent fuel assemblies to be completed

**After 2028** — Disposal of radioactive waste; bringing the site to a safe state; site monitoring

What is more, a processing facility for liquid radioactive waste will be built in Andreeva Bay. The processed waste will be transported to the Regional Storage Center in Sayda Bay. Solid radioactive waste from Andreeva Bay

(over 2,500 cubic meters) will be sent to the same site by 2025.

One of the questions that remain unanswered is what to do with Building No. 5. Earlier this year, an engineering and radiation study was launched to propose available solutions. **"This is a key stage of the project, and it needs to be dealt with to put an end to the long history of Building No. 5,"** says Dmitri Gulak, an acting director of SevRAO.

It is assumed that Andreeva Bay will be turned into a brownfield to accommodate industrial facilities.

**"I can assure Norway will stay with Russia until the end — until Andreeva Bay is clean,"** said Per Einar Fiskebek, an advisor to the governor of Tromsø and Finnmark Counties on cooperation with Russia. At present, Russia and Norway are running the third five-year cooperation program related to Andreeva Bay. In 2022, the fourth program will be developed to cover the period until 2028.

As a mark of continuing cooperation, participants of the reporting meeting — representatives of the Norwegian and Russian authorities — planted an avenue of fir trees in Andreeva Bay.

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**Site rehabilitation by numbers**

**20** out of **24** naval base facilities dismantled

**8** out of **19 ha** of the site territory decontaminated from radionuclides

**18,900 sq m** of new infrastructure constructed

**9,464** spent fuel assemblies in **1,361** containers sent to reprocessing

**46%** of spent nuclear fuel removed from Andreeva Bay

Over **9,000 cu m** of solid radioactive waste transported to the Regional Storage Center in Sayda Bay

**1,900 cu m** of liquid radioactive waste removed

**3.5 mln Ci** down to **2.1 mln Ci** is a decrease in total activity of the facilities in Andreeva Bay

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# Akkuyu on Track to Four Units

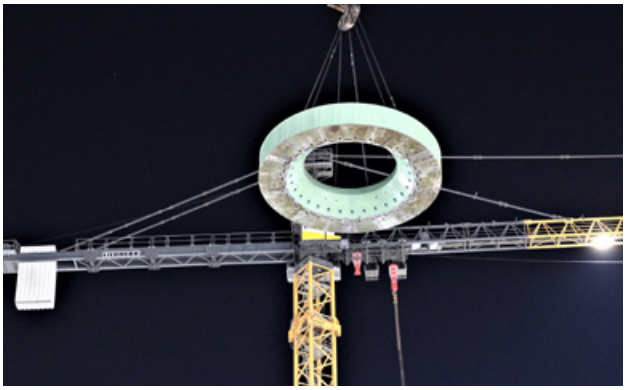
**In this issue, our regular column dealing with Rosatom's geographical footprint spotlights Turkey. This is where the construction of Akkuyu NPP is going full tilt. Read our article to learn more about what has been done in 2021, how Turkish nationals receive degrees in nuclear engineering, and what social and environmental projects are carried out by AKKUYU NUCLEAR.**

Akkuyu is the first nuclear power plant in Turkey. The plan to build a nuclear station originated in the mid-1970s, but the project was suspended untill May 2010 when Russia and Turkey signed an intergovernmental agreement on cooperation in nuclear energy. What is more, it is the first nuclear power plant constructed by Rosatom under the BOO (Build–Own–Operate) model.

Akkuyu will have four units with VVER-1200 reactors. At present, construction works are underway at three of them, while the site of Unit 4 is being prepared for the construction to start soon. First concrete was poured for Unit 1 in April 2018, followed by Unit 2 in April 2020 and Unit 3 in March 2021.

## Construction

In June 2021, Unit 1 passed a major milestone in the construction process as the reactor pressure vessel (RPV) was installed in its permanent position. Right before the RPV installation, a ring-shaped support



structure, which bears the load of the vessel, was assembled inside of the reactor pit. A week later, the third tier of the internal containment shell was installed, with quality of every weld confirmed by ultrasonic testing.

By now, Unit 1 has a core catcher and a dry containment shell installed. Reinforcement and concreting works are currently underway in the premises that will accommodate steam generators and components of the primary coolant piping to form the reactor's primary loop.

Current activities at Unit 2 include the installation of reinforced concrete blocks for the reactor pit, Tier 2 of the internal containment shell, and an RPV support structure.

At Unit 3, concreting of the foundation slabs and basemats for the nuclear and turbine islands has been completed by now.

At Unit 4, current activities are limited to those listed in the preliminary construction permit, which was issued by Turkey's Nuclear Regulatory Authority on June 30, 2021. The regulator continues examining a package of documents submitted to obtain a construction license for Unit 4. AKKUYU NUCLEAR, which is in charge of the project, expects to obtain the license by the end of this year and begin full-scale construction operations as soon as early next year.

### Machinery and equipment

Shipments of steam generators for Unit 2 began in late August. Four 355-ton steam generators will travel 3,000 kilometers by water.

In July, Atommash (part of Rosatom's power engineering division AtomEnergoMash) assembled six accumulation tank halves for the passive core flooding system (PCFS) to be installed at Akkuyu Unit 1 and manufactured the first steam generator for Unit 2. In mid-March, the company got started with the production of a reactor pressure vessel for Unit 3.

### Education

A massive effort was launched to train young professionals for the nuclear industry, which is new for Turkey. In September, 24 students holding bachelor's degrees from Turkish universities were admitted to the Master's programs in thermal power engineering and electrical power engineering offered by Peter the Great Saint Petersburg Polytechnic University. Their curriculum was developed specifically for would-be employees of the Akkuyu NPP. Earlier in August, 22 graduates who had been enrolled in 2019 received their Master's degrees from Peter the Great University. In September, they were employed by AKKUYU NUCLEAR.

This academic year, the curricula of seven vocational schools in the Mersin Province were supplemented with a new subject, Introduction to Nuclear Engineering.

Before the school started, MEPhI graduates with degrees in Design, Operation and Engineering of Nuclear Power Plants, who currently work in AKKUYU NUCLEAR, gave lectures and seminars to vocational school teachers. In its turn, AKKUYU NUCLEAR has developed and published learning aids and materials.

### Caring for people and environment

AKKUYU NUCLEAR respects local traditions. In April, when all the Muslims celebrated the holy month of Ramadan, the company and its subcontractors donated 500 food boxes to the Gülnar District Administration. They were handed out to low-income families living in the district.

In the same month, AKKUYU NUCLEAR financed the construction of a new diner in Büyükeceli, the town closest to the nuclear station, and renovation of the sewerage system in the local school.

The company pays much attention to building environmental commitment and awareness among young people. In June, AKKUYU NUCLEAR employees and schoolchildren from Büyükeceli took part in the Seeds of Hope event organized by the company in partnership with the local junior school. They planted young avocado trees in the school garden, and children received flower seeds as a gift. The school plans to plant a total of 40 fruit trees in its garden.


It has become a tradition for the company to organize, and take part in, the events dedicated to the World Environment Day. In June, about 50 Akkuyu employees took part in a cleanup initiative near the town of Taşucu in which Russian employees live. The initiative aimed to protect breeding grounds of sea turtles and was launched by the head, employees and volunteers of the sea turtle monitoring project in a conservation area in the Göksu river delta with support from the General Directorate for Protection of Natural Resources and Animals under the Ministry of Environment and Urbanization.

Fire guards from the on-site fire brigade in charge of the Akkuyu NPP construction site were directly involved in forest fire suppression efforts in the Mersin province. Out of 48 employees of AKKUYU NUCLEAR's fire brigade, 35 fire guards and two dispatchers took part in suppressing forest fires. To support fire-fighting efforts, the local utility companies and subcontractors involved in the Akkuyu project provided their tank trucks. The fire guards used all available means and equipment, including fire trucks, tank trucks, backpack water tanks, fire swatter and spades to make firebreaks to prevent spreading of fires. The fire suppression operations were supported by municipal fire brigades of the Mersin province and employees of local forestry departments, who coordinated activities of fire guards and assigned areas of responsibility. Apart from fire suppression, AKKUYU NUCLEAR fire guards evacuated people and animals.

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**Audit**

Construction and installation operations performed on the nuclear plant site comply with all Turkish, Russian and international requirements for quality and safety and are closely monitored by AKKUYU NUCLEAR, Turkey's Nuclear Regulatory Authority (NDK), Nuclear Technical Support Company (NÜTED), Turkish Standards Institution (TSE), and independent construction supervisors, including Assystem (France). In March 2021, inspectors from NDK visited production facilities of Russian nuclear equipment manufacturers. The national law requires such manufacturers to be certified by NDK.

Construction of the nuclear power plant was in the focus of attention at a meeting between Turkish President Recep Tayyip Erdogan and Russian President Vladimir Putin in September. **"I have visited Akkuyu — this is**

**where a nuclear plant is built. The project is fully on schedule. More than 10 thousand young Turkish engineers work there in addition to 3,000 Russian engineers, and the number will definitely grow. This will but strengthen our relationships,"** the Turkish President said.

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# Sustainable Development Needs Atoms

**In September, the largest global nuclear organizations, the IAEA and World Nuclear Association (WNA), held international forums dedicated to the role of nuclear power in energy transition, new technologies, government regulation, promotion of nuclear energy, and outlooks for the future. Positive trends have taken shape for the first time in several years.**

Each of the forums lasted several days and brought together expert community. Conference reports were distributed between several parallel tracks. Below is our account of key reports.

## Nuclear in energy transition

In her welcoming speech, WNA Director General Sama Bilbao y León said that nuclear energy should become a key tool in fighting global warming.

IAEA Director General Rafael Grossi sent a similar message. **"At the UN Climate Change Conference COP26 in Glasgow, the Agency will highlight the role of nuclear techniques in supporting mitigation and adaptation efforts, namely in climate-smart agriculture, sustainable land-water use, and the environment. At COP26 I will personally deliver the message that nuclear energy is and must be part of the solution to climate change,"** he said at the opening of the 65th IAEA General Conference.

The IAEA conference also discussed the possibilities of using nuclear energy for production of hydrogen. Representatives

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of OKBM (Rosatom nuclear engineering company) and RosEnergoAtom (Rosatom company operating NPPs in Russia) prepared a report on the development of the hydrogen economy in Russia. **"Development and commercialization of technologies required for safe, environmentally-friendly nuclear hydrogen energy, including consumption, storage, distribution, and nuclear-assisted production of hydrogen is an advanced priority area of scientific and technical development and international cooperation for Rosatom,"** the report says. It is planned to organize the zero-emission production of hydrogen by water electrolysis at the existing nuclear power plants and by natural gas reforming at nuclear plants with high-temperature gas-cooled reactors (HTGRs) and chemical process facilities.

To achieve carbon neutrality, it is important to have accurate estimates of CO2 content in the atmosphere. As was proposed at one of the General Conference events, stable isotopes can be a solution to the problem. Federica Camin, an IAEA Reference Materials Specialist, explained how analyzing isotopic ratios in greenhouse gases is used. "By collecting air samples and defining the ratio of carbon isotopes in the sample's carbon dioxide content, scientists can detect how the gas has been released and determine its origins. This knowledge can be used to help create more effective climate policy and action," she said.

A guide on good practices explaining step-by-step how to carry out the analysis will be published and is currently being developed with support from international experts.

The role of nuclear energy in the climate agenda is studied closely by the financial community. Nick Stansbury, Head of Climate Solutions at Legal & General Investment Management said at the WNA Symposium that climate change posed a huge problem for investors and the financial market in general. We need to transform the existing energy system in less than 30 years although it is already clear that energy transition will need much more time. Another problem is high demand for electric power. Nuclear energy will not solve all the existing problems itself but it should play an important role because it is clean — at least as low-carbon as wind and hydro and definitely less carbon-intensive than any fossil fuel-based energy source. Nick Stansbury asks the question whether the nuclear industry does everything possible for this clean, safe, reliable and low-carbon source of energy to play a key role in the future energy mix.

Fiona Reilly, Managing Director at FiRe Energy Ltd. (UK), spoke similarly. She stressed that far from every investor had a long-held opinion about nuclear energy. The reason is the reputation of the industry. What plays against it is the fact that nuclear energy is still not included in the EU Taxonomy. However, nuclear energy is fully compliant with ESG standards, which speaks in its favor. Environmental, Social and Governance principles distinguish

efforts taken by a company to manage risks in the social, environmental and corporate governance areas.

**"The most important change to be made by the global industry in communications is to focus on the fact that nuclear energy is a key component of achieving the sustainable development goals and not just a reliable source of clean electric power,"** Vadim Titov, President of Rusatom International Network (Rosatom company promoting Russian nuclear industry abroad), said at the WNA Symposium. According to him, nuclear technology can change lives for the better, both using energy and non-energy applications, and this message should be delivered to a broader audience.

The IAEA makes a large contribution to promoting non-energy applications of nuclear technology by developing nuclear solutions for harvest improvement and pest control. Research in this field is conducted in a number of laboratories, which are currently being upgraded. Financing for the research comes from the Member States. **"Russia provides expert and financial support to the Secretariat across all of its key activity lines. And we will continue to do it in the future,"** Rosatom Director General Alexey Likhachev said in his speech at the General Conference.

## Technology of the future

Development of nuclear technology and its applications, both energy and non-energy related, depends to a greater extent on the emergence of new reactors and fuel, as well as safety and sustainability of nuclear power plants during operation and after decommissioning.

The two forums paid great attention to small modular reactors (SMRs) and innovative reactor technology. It is hardly surprising because small-scale power generation and development of new reactors have been all the buzz over the last several years.

James Nevling, Senior Manager of Nuclear Fuels department at Exelon Generation, noted that SMR-related projects were numerous and this market would strengthen considerably by 2023.

Rumina Velshi, President of the Canadian Nuclear Safety Commission (CNSC), echoed the words of James Nevling. The main challenge in the SMR industry is a great number of different technologies, she believes. In Canada, 12 of them are currently undergoing the preliminary licensing process, which is very resource-consuming. According to Rumina Velshi, the overarching goal in a situation like this is to select the most promising technologies that are likely to succeed.

Anton Moskvin, Vice-President for Business Development and Marketing at Rusatom Overseas, continued on the topic of government regulation in the SMR segment. He is convinced that international harmonization of licensing procedures was a prerequisite for the development of a global small modular reactor market. As for now,


differences exist not only in the licensing of small and large power reactors, but also in national standards. For this reason, national standards should be harmonized with the IAEA requirements.

Small-scale power generation was also discussed at the IAEA General Conference. Small modular reactors are a priority for Rosatom. The world's only floating nuclear power plant with two SMRs is already generating electric power and heat in the Russian region of Chukotka. Another four upgraded floating power units will be built and deployed in the same region to supply power to a large mining project. An onshore SMR will be built in the Russian Republic of Sakha (Yakutia). **"We totally support the initiative of Mr. Grossi to launch a cross-department initiative on small modular reactors. The next logical step would be an international IAEA ministerial conference on SMR technologies. We are ready to hold this conference in Russia,"** Alexey Likhachev said.

Safe decommissioning is another important trend. According to the IAEA estimates, 12% to 25% of the capacity existing as at 2020 will be decommissioned by 2030. "Innovative digital technologies can provide crucial insights for the planning and implementation of decommissioning projects. They can provide support in decommissioning situations that are difficult or dangerous for human workers and can help ensure that projects are executed safely and effectively," Mikhail Chudakov, IAEA Deputy Director General and Head of the Department of Nuclear Energy, said in his opening remarks at the event.

## Nuclear outlook

The IAEA forecast is based on three scenarios. The best-case scenario suggests that installed nuclear capacity will double by 2050. The actual outcome will depend on whether 550 GW of new capacity is commissioned and the service life of existing plants is extended. In the low case scenario, capacity growth will be limited, **"causing us to fall well short of doing what is necessary to avoid a climate catastrophe,"** Rafael Grossi forecasts.

The World Nuclear Association also developed three scenarios but viewed through the prism of the nuclear fuel cycle. In early September, WNA published its regular Nuclear Fuel Report, which was presented at the Symposium by two co-chairmen of the Fuel Report Working Group, James Nevling from Exelon and Alexander Boytsov, an advisor to First Deputy CEO at TENEX. According to the authors, the negative trend mentioned in the 2013, 2015 and 2017 reports has finally reversed. **"Despite a slight reduction in nuclear generating capacity projections that can be seen in the near to mid term in the Reference and Upper scenarios, all three cases show considerable growth from 2035 onwards due to vast nuclear construction programs in East and South Asia, extended operational lifetimes of existing reactors and anticipated expansion of the pool of**

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**nuclear countries due to more newcomer countries expected to operate their first reactors before 2040,"** says a comment to the report.

In the short to medium term, the Reference and Upper Scenarios provide for some decline in global nuclear generating projections in 2025–2035 due to various delays caused by the Covid-19 pandemic and reconsideration of nuclear programs in some countries (e. g. South Korea, Japan, Russia and the USA). No new project has been canceled yet. In the long term (after 2035), there is a more positive outlook compared to the 2019 edition due to wider prospects for nuclear energy and improved climate change policies in many countries. NL

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# Source of Energy, Source of Knowledge

**Work started on the construction site of Egypt's first nuclear power plant to prepare the construction pit for key facilities of Unit 1. Rosatom top managers and Egyptian high-rank officials visited the construction site.**

Gennady Sakharov, Director for Capital Investment, Construction Supervision and Regulatory Audit at Rosatom, gave the go-ahead to a new stage of the nuclear construction project at the official kick-off ceremony. During his inspection visit to the site, he was accompanied by Vice President of ASE (El Dabaa general contractor) and Director of El Dabaa Project Grigoriy Sosnin, Deputy Director for International Project Supervision at Rosatom Center of Expertise for Major Construction Projects Vyacheslav Makhonin and, on the Egyptian part, Head of El Dabaa Project at the Nuclear Power Plants Authority (NPPA) Mohamed Dowidar.

The Dabaa project is implemented in three stages. During the current first stage, the site is prepared for subsequent construction works. In particular, a system of barriers will be installed in the construction pit to prevent the ingress of water. The second stage will begin after the construction license is obtained — this is when all construction works will be carried out. During the third stage, the nuclear power plant will pass through a series of hot functional tests and the reactors will be brought to criticality.

The package of contracts for El Dabaa project provides, among other things, for the training of Egyptian employees. In early September, the first groups of El Dabaa employees started a training program at the Saint Petersburg branch of Rosatom Technical Academy.

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The program begins with a six-month Russian language course. It has to be passed by 465 Egyptian students. After that, they will take theoretical classes based on the materials about Leningrad II (a reference nuclear power plant) and then proceed to practical training classes and do an internship at the plant. All in all, Rosatom will train around 1,700 employees by 2028. Training programs will be held at Rosatom Technical Academy in Russia and El Dabaa training center in Egypt.

**"We are thankful to Rosatom for its end-to-end offer for the deployment of nuclear technology in our country. We have ambitious plans in this field. And we understand that substantial resources are needed to train highly qualified employees for four units to be built in El Dabaa and organize an internship at the operating reference plant. A step towards this cooperation was made more than ten years ago when the first group of Egyptian employees came to Russia to study at Rosatom Technical Academy (then the Central Institute for Continuing Education and Training). That was an important moment for the both parties as it symbolized a positive development of our cooperation,"** said Mohamed Ramadan, NPPA Deputy Chairman for Operation and Maintenance and El Dabaa Project Supervisor, at the official ceremony dedicated to the beginning of the training program.

According to Yuri Seleznyov, Rector of Rosatom Technical Academy, the Saint Petersburg branch of the Academy installed additional equipment in its classrooms and upgraded the IT infrastructure to improve the quality of staff training. The training program will be conducted by a team that includes experienced operators who have spent years working at nuclear power plants, and young professionals who have passed an extended training course, completed an internship at a nuclear plant and speak English fluently. By the end of the year, the Saint Petersburg branch of the Technical Academy plans to put in operation an analytical simulator. In addition, Rosatom Technical Academy will improve living conditions for the students, taking into account the cultural specifics of the Arab country.

> **AtomStroyExport (ASE)** is Rosatom's engineering division, which is a global leader constructing most of the nuclear power plants abroad and having the world's largest portfolio of nuclear construction contracts. The division is active in Europe, Middle East, North Africa, and Asia Pacific.

Vladimir Artisyuk, an advisor to the Director General of Rosatom, pointed out that Egypt was a developed country in terms of technology and could become a continent leader by solving major energy tasks in partnership with Russia. **"There are many young people here who strive to have a good job in the future, and the national government works actively on the global scale to provide them with this opportunity. Since 2017, Egypt has organized annual Global Youth Forums, inviting UN top officials to participate. IAEA top-rank officials have taken part in the forums since 2019. This is where Egypt's national projects, including nuclear energy, are rooted in. The country has a good chance to become an energy producer for the entire African continent,"** Vladimir Artisyuk said.

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