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Third Afloat

On May 25, the third Project 22220 nuclear icebreaker Ural, one of the most powerful ice-breaking vessels in the world, was floated out at the Baltic Shipyard in Saint Petersburg.

The float out is a serious milestone in shipbuilding. During the launching, the ship's hull is transferred from the slipway into the water for the subsequent fitting-out. Shipbuilders fairly see the ship launching as a celebratory occasion. Hundreds gathered to watch how the nuclear-powered icebreaker Ural was floating out.

After the chief engineer gave a command to launch the ship, the steel structure keeping 19,000 metric tons of the vessel's hull was cut to let it go. Ural slid into the waters of

the Neva River met with loud applause of the crowd. At the time of launching this icebreaker was 7,000 tons heavier than its Project 22220 forerunner. The explanation is simple: Ural had two RITM-200 reactor units already installed and was almost completely fitted out with electric propulsion system, which includes electric propulsion motors, generators, switchgear, etc. Previously reactors and electric propulsion systems had been installed when the ship was already afloat. In the case of Ural, shipbuilders decided to change the sequence of operations to reduce the time and cost of construction without compromising on safety. The commissioning is scheduled for August 2022.

Arktika (Arctic) and Sibir (Siberia), the first two Project 22220 icebreakers, are already afloat and will be put into operation in 2020 and 2021 respectively. At present, Arktika's reactor is being loaded with nuclear fuel.



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All nuclear icebreakers are being built at the Baltic Shipyard under the contract with Rosatomflot, a Rosatom Group operator of the nuclear fleet. According to Rosatom Director General Alexey Likhachev contracts for the construction of two more Project 22220 icebreakers will be signed by the end of this summer. Preparations are now underway to tender out the contracts. The total price will be around RUB 100 billion (USD 1.5 billion). For the very first time nuclear icebreakers' construction will get a mixed funding. The federal government will provide RUB 45 billion (USD 700 million), with the rest (RUB 55 billion or USD 845 million) to come from Rosatom and commercial banks. The Russian government financed construction of the previous icebreakers entirely on its own.

“Our nuclear fleet is what the country is proud of. I am pleased to see that this is where we are not losing ground but growing and building new ships,” Elvira Nabiullina, Governor of the Bank of Russia and a “godmother” of the icebreaker, said at the ceremony.

“It is this new generation of icebreakers to which we pin our hope of developing the Northern Sea Route. This is an all-new ship,” Russian Vice Prime Minister Yuri Borisov said.

**Key specifications of the Ural icebreaker:**

- SHAFT POWER: **60 MW**
- SPEED: **22 KNOTS** (IN OPEN WATER)
- LENGTH: **173.3 M**
- WIDTH: **34 M**
- HEIGHT: **52 M**
- DRAFT: **10.5 M / 8.65 M**
- MAXIMUM ICE THICKNESS: **2.8 M**
- FULL DISPLACEMENT: **33,540 TONS**
- ESTIMATED SERVICE LIFE: **40 YEARS**

“Serial construction of these new-generation icebreakers is a key to successful development of the Arctic region,” Sergey Kirienko, First Deputy Chief of Staff of the Presidential Administration of Russia, agreed with him.

Like other Project 22220 icebreakers, Ural has two RITM-200 reactor units with a thermal power of 175 MW each. The ship was designed at the Aisberg Design Bureau in 2009. It allows for the operation both in deep waters of Arctic seas and estuaries of polar rivers. The icebreaker will operate in the Western part of the Russian Arctic (Barents, Pechora and Kara Seas) and shallow waters of the Yenisei River and the Gulf of Ob.

According to the Russian Academy of Sciences, the Arctic accumulates a large portion of the global gold, oil and gas reserves estimated at around USD 30 trillion. In December 2018, Rosatom has been appointed as an operator of the infrastructure on the Northern Sea Route, which is the shortest way between Northern Europe and Eastern Asia.

Earlier, Rosatom's Director General Alexey Likhachev announced plans to increase freight traffic on the Northern Sea Route to 92.6 million tons by 2024.



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Year-round navigation here will be guaranteed when the first icebreaker of the Leader series is commissioned. This ship will be two times more powerful than those now under construction and capable of breaking 4-meter thick ice. Rosatomflot is waiting for approval of the Zvezda Shipyard located in Russia's Far East. The plans are to build three icebreakers of the Leader series. **“These vessels will be used primarily on the eastern section of the Northern Sea Route to transport cargo to China, Japan and South Korea,”** Alexey Likhachev said. The first Leader icebreaker is expected to be commissioned in 2026–2027.

By 2035, Russia will have at least nine nuclear icebreakers. For the time being, Rosatomflot has four icebreakers and a lighter. The service life of their nuclear propulsion units can be extended till at least 2025. [NL](#)

The Next Episode

Atomexpo set a new high with over 40 agreements signed. We continue telling you about these contracts. See the previous issue for the beginning of the story.

NUCLEAR POWER PLANTS

Low-power plants are a new trend that is taking shape in today's nuclear power industry. Attempts to design small modular reactors (reactors with a capacity of up to 300 MW) are being made by both leading nuclear companies and startups. The reason why the trend is growing stronger is simple: small modular reactors (SMRs) can be deployed



in remote areas and island countries to meet local demand for electricity, heat and, if properly equipped, even fresh water. Modular reactors for low-power plants will be produced in series and loaded with fuel at the manufacturing site. Once delivered to the point of destination, they will need only installation and no construction.

SMRs are also expected to supply power to off-grid industrial facilities, such as drilling rigs, mining and steel-making plants. Additionally, they can be easily integrated into the existing infrastructure to replace thermal power plants polluting the environment.

IAEA's booklet *Advances in Small Modular Reactor Technology Developments 2018*, which is updated every other year, lists 56 SMR designs, 16 of which have been produced in Russia. Given the reports presented at global forums and conferences, the number of SMR designs worldwide is approaching a hundred.

Modular reactors

TENEX signed a memorandum of understanding with Smart Power, a South Korean SMR construction vendor. The parties are negotiating terms and conditions of SMR



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fuel supply and management of spent fuel and nuclear waste.

Small nuclear power plants

Rusatom Overseas signed a memorandum of understanding with Russia's GHP Group. The companies will team up to develop power supply solutions for the Suroyam iron ore deposit in the Chelyabinsk region (Russia). The document outlines actions to be taken, including site selection and feasibility studies, if the decision is made to construct a small nuclear power plant based on a RITM 200 reactor.

PRODUCTION

Pipes

Rosatom and TMK, a Russian pipe producer, made an agreement to manufacture tubular products and develop new types of steel pipes. The document provides for cooperation in research and development to create new steel grades and modify surface properties of steel products. It was signed by Kirill Komarov, Rosatom's First Deputy Director General for Corporate Development and International Business, and Alexander Shiryaev, CEO of TMK.

Titanium

Rosatom continues its expansion into non-power markets. Rosatom's TVEL Fuel Company made an agreement with Germany-based Hermith on the joint development of titanium production and sales of products on the European and other markets.

Their joint venture will be based at the Rosatom's subsidiary Chepetsk Mechanical Plant (CMP) and produce steel wire for additive manufacturing, sonotrodes, vehicle suspension components, medical implants and prosthetic devices, and pipe spools for the aircraft industry.

“We have been working with TVEL since 2016 when we organized shipments of semi-finished titanium alloy products to Western Europe within the shortest time possible (key customers were Bombardier, Leonardo, Fucine Umbre, ThyssenKrupp, VacuCast and Permedica – RN). With the new agreement, we have moved to a new level and consider supplying finished products to aircraft manufacturers. This opens up a new opportunity to set up an aerospace and additive manufacturing cluster in Russia with the USA, Western Europe and Canada as target markets,” Hermith's CEO Alexey Rasskazov said.

New engine family

Rusatom Additive Technologies and the Ural Works of Civil Aviation signed a strategic cooperation agreement to develop the EM-401 engine family, create a competency center for gas turbine manufacturing, and promote a broader industrial collaboration.

Low voltage switchboards

Ural Switchgears (USG) series of low voltage switchboards (LVS) manufactured by Rusatom Automated Control Systems (RASU) and the Urals Electromechanical Plant (UEP) were certified as meeting the International Electrotechnical Commission (IEC) standards by the ASEFA, a French-based electrical product

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certification body. This enables RASU to bid for contracts to supply LVS systems to Russian-designed nuclear power plants constructed abroad. Within the next 10 years, UEP will produce over 12,000 low-voltage switchboards.

LVS are used to distribute electric power to equipment operating at low-voltage and essential to the reliability of an electrical system.

The need for LVS certification arose in late 2018 as almost all countries where Rosatom operates (Finland, Hungary, Egypt, etc.) have started to require international certification. An EU-accredited third party certification body was to confirm that the company's equipment and technologies conformed to the international standards and contract terms. Prior to that, the manufacturer had to be assessed for information security, environmental resource management, occupational safety, etc.

This important stage is now over, but there is still a lot of work to do. RASU also intends to have its other equipment and process control systems (direct current boards, smart LVS, upper-level software and hardware, etc.) certified for compliance with international requirements.

Radiation control

RASU, France-based Mirion Technologies and its exclusive Russian partner Radico signed a memorandum of understanding to increase localization in radiation control equipment and develop next-generation radiation control systems for power plants and other nuclear facilities in and outside of Russia. A roadmap on how to achieve these goals will be ready by the year-end. **“We are switching**

from competition to cooperation on level terms, and this is a win-win strategy. As an integrator of process control systems, RASU will increase the share of in-house products in its portfolio, Radico will be awarded an engineering contract, while Mirion will be in charge of sales channels and market expansion,” Andrey Butko, CEO of RASU, said.



Pumps

The Central Design Bureau of Machine Building signed a contract with Czech-based ŽĎAS for the supply of forgings to be used in making pumps for the Kursk, Leningrad II and Akkuyu nuclear power plants. Talks are underway to supply forgings for main circulation pumps (MCP) of other plants. Once machined and tested, safety class 2 and 3 forgings will be used to manufacture MCP components, including those for the latest pump models with water lubrication. In 2019, ŽĎAS will produce over 400 forgings with a total weight of nearly 200 tons.

Gas turbines

AtomEnergoMash and US-based PW Power Systems (PWPS) signed a memorandum of understanding to construct small and



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medium-sized gas turbine power plants and develop the production of gas turbine components in Russia. The parties intend to run joint projects in Russia and other countries.

Raul Pereda, President and CEO of PWPS, noted that he was pleased to make an agreement with one of Russia's largest mechanical engineering companies. PWPS gas turbines have been used in CIS countries for more than 20 years, and the company hopes that cooperation with AtomEnergMash will help it bring even more competitive solutions to the market.

PW Power Systems is a subsidiary of Mitsubishi Hitachi Power Systems, Ltd. The company develops and manufactures gas turbines based on Pratt & Whitney® aircraft motors with a capacity ranging from 30 to 140 MW. At present, over 2,000 industrial gas turbines manufactured by PWPS operate in more than 50 countries.

NUCLEAR AND OIL

Russia is building Egypt's first nuclear power plant El Dabaa, but this is not the only area where the two countries cooperate. AtomEnergMash (Rosatom power engineering company) signed a memorandum of understanding with Petrojet, a leading EPC company in the Middle East and Africa. The parties agreed to join their efforts in the production and supply of equipment for nuclear power plants, oil extraction and petrochemistry.

Petrojet also signed an agreement with the Central Research Institute for Machine Building Technology on cooperation in nuclear projects. The Russian party will

arrange for the certification of materials, processes, equipment and laboratories, as well as train and certify the staff in compliance with Russian standards and regulations.

Waste management

ZiO-Podolsk (part of Rosatom's power engineering division) and Swiss subsidiary of Hitachi Zosen Corporation - Hitachi Zosen INOVA - signed an agreement to set up a consortium to develop and supply electromechanical and process control systems for four waste-to-energy plants in the Moscow Region.

Zio-Podolsk is a supplier of turbine island equipment for plants constructed in Russia by RT-Invest using the technology developed by Hitachi Zosen INOVA. The company is expected to produce a total of 14 boilers – three for each plant in the Moscow Region and two for a plant in Tatarstan.

MEDICINE

One of Rosatom's priority lines of business is nuclear medicine, particularly, diagnostics and radionuclide therapy used in the treatment of cancer, cardiac and neurological diseases. Rusatom Healthcare is in charge of the company's operations in this area and comprises such industry leaders as Research Institute of Applied Physics and Automation (NIITFA) (a manufacturer of equipment for nuclear medicine), Izotop (an isotope supplier), Karpov Institute of Physical Chemistry (a radiopharmaceuticals manufacturer) and so forth.

At ATOMEXPO 2019, Rusatom Healthcare and NIITFA signed a memorandum of



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understanding with Slovenia's Cosylab on the cooperation in developing integrated software for NIITFA's radiation therapy units. Cosylab will be involved in the implementation of a quality management system and international certification of the software. The parties also consider developing medical dosimetry software and creating a cancer treatment information system.

PEOPLE

Population

Large industries, such as nuclear power generation, cannot exist without public support. The Russian Association of NPP Regions and Hungary's Association for Public Control, Information and Regional Development (TEIT) signed a memorandum of understanding. It provides for knowledge exchange to raise public awareness and confidence in the nuclear power industry. The parties expect to continue their cooperation within the Group of European Municipalities with Nuclear Facilities (GMF), which the Russian organization intends to join by the end of the year.

Human resources

Highly skilled workforce is essential for the nuclear industry. Rosatom International Network (RIN) and Hungary's University of Dunaújváros made an agreement to hold joint lectures and seminars, publish learning materials, set up a student exchange program, etc. According to Rector András István, the University of Dunaújváros and Rosatom have a vast practical and theoretical

knowledge base, specifically in material science and advanced welding technologies.

Meanwhile, Rosatom's Technical Academy (a part of RosEnergoAtom) signed an agreement on training nuclear workforce with Uzbekistan's Nuclear Energy Development Agency (Uzatom) and a memorandum of understanding on cooperation with the European Nuclear Education Network (ENEN).

BACK END

Rosatom fuel division TVEL and Spain's IDOM signed a memorandum of understanding on the development of joint international business. The parties are yet to outline the areas of nuclear and non-nuclear cooperation. First and foremost, these will include nuclear decommissioning, which holds much promise for Rosatom's nuclear fuel company. **"We have unique experience in nuclear legacy management, including the use of technologies for returning nuclear sites to greenfield status and safe radioactive waste storage. Our partners from IDOM also have nuclear decommissioning competencies. By joining our efforts, we will be able to bid for international projects,"** Konstantin Tulupov, TVEL's Vice President for Business Development said. IDOM is a provider of engineering and consulting services in power generation, infrastructure, civil engineering and environmental protection.

It should be noted that Rosatom has solid experience in decommissioning nuclear power plants, including in cooperation with foreign companies. In May, a consortium of Uniper Anlagenservice and Rosatom's NUKEM Technologies won a contract for the



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dismantlement of two boiling-water reactor vessels at Oskarshamn and two more at Barsebäck in Sweden.

FUEL

TVEL and the Egyptian Atomic Energy Authority (EAEA) signed a contract for the supply of uranium components from the Novosibirsk Chemical Concentrates Plant. The components will be used in the production of low-enriched nuclear fuel for the ETTR-2 research reactor installed at the Nuclear Research Center in Inshas. The reactor is operating since 1997 and used to carry out research in particle physics, material science and fabricate stable isotopes.

STANDARDS

The Central Research Institute for Machine Building Technology and France's Bureau Veritas Exploitation (an international certification agency) intend to pool their resources in Europe and Russia to certify welding procedures and welders in accordance with international standards. **“This cooperation makes it much easier for Russian welders to obtain work permits in Europe and for Russian manufacturers to supply their products abroad. Our company will provide the testing site, prepare the certification procedure, and advise the welders willing to get certified at Bureau Veritas. At the moment, we are the only Russian company where you can be trained and certified to any applicable standards, including those of the National Welding Control Agency, nuclear industry regulations and the EU rules,”** Vladimir Orlov, Director of the Institute, said. 



Vietnam to Build Nuclear Science and Technology Center

Rosatom and the Ministry of Science and Technology of Vietnam signed a memorandum to establish a time schedule for the construction of a nuclear science and technology center (NSTC) in Vietnam.

Alexey Likhachev, Rosatom Director General, and Chu Ngoc Anh, Minister of Science and Technology of Vietnam signed the document on May 22, in presence of Russian Prime Minister Dmitry Medvedev and Vietnam's Prime Minister Nguyen Xuan Phuc.

The cooperation agreement to build the NSTC was signed back in 2011. In 2017, the parties signed a memorandum of understanding on the plan to carry out the NSTC project. The memorandum signed in May is a logical continuation of the agreements reached earlier.



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They provide for the construction of a nuclear center and installation of a water-cooled research reactor with a thermal power of up to 15 MW. The center will have research laboratories with all the necessary equipment and infrastructure. Russian nuclear companies have accumulated extensive experience in the construction of different types of research reactors, with over 70 research units built around the world.

Rosatom offers NSTCs as a comprehensive modular solution similar to nuclear power plants. Just like in a jigsaw puzzle, each customer chooses particular modules to build its own nuclear center to meet specific goals. Each NSTC module can itself be sold as an individual solution. Besides, Rosatom offers end-to-end project delivery services, including staff training, necessary nuclear infrastructure compliant with the IAEA requirements, public awareness programs, NSTC design and construction, nuclear fuel supply, as well as maintenance, retrofitting and decommissioning services.

What is an NSTC?

A nuclear science and technology center is an integrated facility. Its two central

elements are a nuclear research reactor and laboratories. Other main components are a nuclear medicine center, infrastructural facilities, and administrative premises.

An NSTC may be used to fabricate isotopes for industrial and medical purposes, sterilize medical equipment, and conduct neutron capture therapy. In addition, a center may include a radiation biology laboratory to carry out agricultural trials and a laboratory for material studies to develop and test new and modified materials. For example, Zambia plans to use its yet to be constructed NSTC in medicine, agriculture and the mining industry. Another area of application is modification of existing materials, particularly thin film for solar panels. NSTC may also be used to train employees for the nuclear industry.

Not Vietnam alone

Several NSTC projects are at an advanced stage of construction. One of them is being built in El Alto (Bolivia). The very first talks on civil nuclear cooperation between Bolivia and Russian were held in 2015. As soon as spring 2016, the governments





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signed a bilateral agreement to build a nuclear research center in Bolivia. A year and a half later, the parties signed a general construction contract on the sidelines of the IAEA General Conference. Rosatom plans to deliver the project ahead of schedule. The first facility - a cyclotron for nuclear pharmacy purposes - will be commissioned by the end of 2019. The entire center will be completed in 2022.

The Bolivian project is unique for its location, which is the highest ever site

(4,100 meters above the sea level) to accommodate a nuclear facility. The Bolivian center will have a water-cooled research reactor with a rated capacity of 200 kW, a multi-purpose gamma irradiation unit, a cyclotron for radiopharmacy purposes, an engineering department, and several research laboratories. Its designed lifecycle is 50 years, but it can be extended further. Apart from nuclear research, the center in Bolivia will promote the use of nuclear technology in agriculture, medicine and industry. [NL](#)

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Nuclear as a Driver of European Economy

In its study of the EU nuclear industry, Deloitte, a global network of consulting and audit service providers, makes a forecast of the industry's contribution to the European economy until 2050. Given the multiplier effect, the contribution of nuclear to the GDP will grow, in the best-case scenario, from current EUR 507.4 billion to EUR 575.9 billion in 30 years.

Given the growing interdependency of global social and economic processes, accurate evaluation of the role of activities carried

out by separate companies and entire industries is becoming increasingly important for the achievement of 17 UN Sustainable Development Goals.

The adoption of the goals marked a transition from formulating a concept of the balanced economic, environmental and social development to solving particular tasks and setting up indicators to measure the progress towards these goals.

In this respect, a new study conducted by Deloitte for Foratom, a trade association for the nuclear energy industry in Europe, deserves much attention. The study makes an attempt to assess a cumulative economic impact the nuclear industry has on the GDP, employment, tax payments and other key macroeconomic indicators of the EU countries.



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Forecast for Europe

Deloitte's study relies on FTI-CL Energy 2018, a report prepared by FTI Consulting experts who identified three scenarios of Europe's nuclear sector development until 2050. In the "Low Scenario", the aggregate nuclear power capacity in Europe will decrease to 36 GW, with the share of nuclear in the energy mix dropping to 5%. The "Medium Scenario" sees the aggregate capacity of around 103 GW, with a 16% share of the energy mix. In the "High Scenario", the nuclear capacity will grow to 150 GW and have a share of 24%. As a comparison, the total installed capacity of European nuclear power plants in 2019 is 118 GW (25% of the current energy mix).

Deloitte factored in direct effects of the civil nuclear industry on the European Union's GDP and new, including highly qualified, jobs. Deloitte's experts also calculated the average income of households with family members employed in the nuclear industry, government revenue from taxes, and trade balance. The study is the most remarkable for the multiplier effect it estimates. It explains how much money will be generated and how many jobs will be created in the economy



thanks to the revenue and new jobs created by the nuclear industry. Following the logic of the analysts, new jobs in the nuclear industry create jobs in other industries along the chain of supply; expenses of nuclear industry employees increase consumer spending, which drives the economy. As a result, the multiplier effect is also observed in taxes as the government receives taxes from both nuclear companies and their suppliers and service providers. Taxes paid by employees in the nuclear and other industries are also taken into account.

Deloitte experts make a conclusion that the nuclear industry performance in the "High Scenario" will make a sizable contribution to the EU economy. Despite a relative reduction of the nuclear industry's contribution to the EU GDP (from 3–3.5% in 2019 to 1.5–2% of the energy mix in 2050), it will grow in natural terms from EUR 507.4 billion to EUR 575.9 billion.

The most important point of the study is, perhaps, the idea that the "High Scenario" is beneficial for both the nuclear industry and the entire economy of the European Union. **"The incremental economic benefits arising from the deployment of a High Scenario with an installed capacity of 150 GW in comparison to the Low Scenario would be widespread. For instance, through the deployment of the High Scenario, the nuclear industry would account for a yearly incremental impact of EUR 294.1 billion in the EU GDP. In other words, the overall incremental impact of the High Scenario on EU GDP would rise to EUR 8.8 trillion throughout the timespan of 2020–2050,"** the study says.

Besides, as experts point out, the European economy has to solve two major problems



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related to the power industry. First, carbon dioxide emissions have to be cut by 95% from the 1990 level till 2050. Second, Europe has to increase power generation from the current 3.1 TWh to 4.1 TWh. **“As a well-established large-scale zero-carbon technology in power generation, nuclear energy has the potential to play a decisive role in realizing the EU’s ambitious low-carbon targets for 2050,”** the survey states.

Rosatom’s statistics

Leading international vendors have been speaking out about the beneficial effects of the nuclear industry for the entire economy for a long time now. According to the Rosatom Group’s estimates, every single job in the nuclear construction segment creates an average of 10–12 jobs in related industries (metallurgy, mechanical engineering and others). As of end of 2018, Rosatom Group employed over 255,000 people. Last year its total labor costs increased by 11.2% year-on-year and reached almost USD 5.17 billion.

Rosatom’s influence on suppliers can be estimated by procurement costs. In 2018, the Group spent USD 10.9 billion and signed 17,330 supply contracts, with the average contract price of around USD 629,000. Taxes paid by Rosatom in 2018 amounted to USD 3 billion (up by USD 633.2 million year-on-year).

When analyzing this data, it should be taken into account that “direct jobs” mentioned in the study by Deloitte include only jobs related to construction, maintenance and decommissioning of nuclear stations. However, Rosatom’s market position is absolutely unique since its integrated



offer covers the entire production chain, including design, construction and operation of nuclear power plants; mechanical engineering, fuel fabrication from uranium exploration and mining to spent fuel disposal, plant decommissioning, and nuclear waste management. Besides, the company develops nuclear medicine, manufactures irradiation facilities designed to treat produce and food and increase their shelf life, conducts research and is engaged in other areas contributing to the achievement of the UN Sustainable Development Goals.

It should be noted that, apart from Russia, Rosatom operates in other countries and creates a positive impact on local economies. **“Thanks to the established supply and production chains, each dollar invested in a nuclear construction project generates an average of 4.3 dollars for the GDP of the project’s country, up to 4–5 dollars for the Russian economy, and an average of 1.4 dollars in taxes for the country. The supplier country receives large taxes as well,”** says the Results for Sustainable Development, a report prepared in 2017.

Both Russian and European nuclear industries, however different, are similar



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in their irreplaceable contribution to the reduction of greenhouse gas emissions.

All Russian-designed nuclear power plants operating in the world prevent 556 million tons of carbon dioxide emissions. **“Carbon dioxide emissions are one of the major challenges faced by the global community.**

The nuclear industry saves 2.2 billion tons of CO2 annually,” Rosatom’s Director General Alexey Likhachev said at ATOMEXPO Forum in April. According to him, this is how much carbon dioxide would have been produced by power plants all over the world if they had used coal or gas instead of nuclear fuel. **NL**

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Updating Russia's icebreaker fleet until 2035



LIDER



LIDER



URAL



LIDER



LIDER



SIBIR



LK-60



LK-60



ARKTIKA



LK-60



LK-60



50 LET POBEDY



50 LET POBEDY



URAL



URAL



YAMAL



YAMAL



SIBIR



SIBIR



VAYGACH



VAYGACH



ARKTIKA



ARKTIKA



TAYMYR



TAYMYR



50 LET POBEDY



50 LET POBEDY

2019

2024

2030

2035



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New era of Turkey's energy transformation

Today, energy demand is shifting eastward, mainly Southeast Asia and China. According to the World Energy Outlook 2018 (WEO 2018) by the International Energy Agency (IEA), more than 40 percent of global energy demand came from North America and Europe and only 20 percent from Asia in 2000. This ratio is going to be reversed by 2040, experts say.

More and more countries are turning towards renewable energy. According to Alparslan

Bayraktar, Deputy Minister of Energy and Natural Resources and President of World Energy Council Turkey, energy world is currently going through an inescapable transition to renewables. Two-thirds of total new installed capacity in the electricity sector have come from green energy. It set a record high of 178 GW of additional capacity last year.

Whether in previous years major energy discussions were driven by two main motivations: security of supply and climate change, current considerations go beyond these issues.

Bayraktar points to new phenomena: decarbonization, decentralization, digitalization, and diversity. New sustainable solutions are incorporated into the policies of many countries.



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As a part of global transition, Turkey has been undergoing a major transformation since 2002, which Bayraktar calls Transition 1.0. During this conversion role of the government has shifted more towards regulation and policymaking. Then in 2017, the Ministry of Energy and Natural Resources announced its National Energy and Mining Policy, which is described by the deputy minister as Transition 2.0, because of its integrated approach from energy to industry and then to employment.

Turkish Energy Transition 1.0

Bayraktar said that Turkish energy markets had two main characteristics, which are also their major challenges. The first one is a growing demand. According to the IEA, Turkey's energy industry will face the fastest medium to long-term growth among the IEA member countries. While the second challenge is a dependency on imports with the current ratio at almost 70 percent in primary energy resources.

To meet this growing demand while dealing with import dependency at the same time, Turkey decided to transform its energy markets and launched a large-scale market reforms.

According to Bayraktar, the main objectives of that transformation were to establish financially viable, stable, transparent, and competitive markets under independent regulation to ensure reliable and affordable energy supply in an environmentally friendly manner. These purposes are based on several laws and covering most aspects of the relevant European Union (EU) acquis. As stated in the EU's Turkey 2018 Report, **“Turkey has continued to align with the**



EU acquis. As regards the internal energy market, good progress was made on the electricity market and good progress can be reported on renewable energy and energy efficiency.” Since 2002, the Turkish energy market has attracted more than 60 billion dollars in investment that particularly was made by domestic and foreign private companies.

During Transition 1.0 the vertically integrated state monopoly model was turned into the well-functioning competitive market model.

Turkish Energy Transition 2.0

However, Turkish energy markets are still in a transition period. In 2017 new Turkish National Energy and Mining Policy (NEMP) was announced proclaiming the second transition period, Transition 2.0. Bayraktar also points out that NEMP is based on three pillars: security of supply, localization, and predictability in the markets.

Defne Arslan, Turkey Representative at the Atlantic Council, US-based think tank on international relations, noted that **“Turkey**



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is a country with few sources of mineral wealth.” This is why the country needs “to secure supplies” of energy through a combination of imports and indigenous production. She further pointed out that **“Turkey’s strategic position between producing countries in the Middle East and in the Caspian and the consuming European market, offers the prospect of acting as a bridge and contributing to European energy security.”**

Turkey aims to achieve a more competitive structure in the energy sector and create the right price signals for investors to achieve predictability in the markets

The third pillar of the NEMP is localization, which is mostly connected with clean coal

technologies and increasing the share of renewables. Turkey has established a “renewable energy resource zone (RE-ZONE) competition mechanism”. According to Alparslan Bayraktar this mechanism would encourage investors not only to build power plants but also to manufacture renewable energy equipment in Turkey. Additionally, the projects will bring new employment opportunities into the region, as well as business opportunities to the small and medium-sized enterprises. Through the NEMP, Turkey wants to achieve energy sovereignty, security in supplies and facilitate international partnerships. Bayraktar expects this new era in energy policy to raise Turkey from a powerful regional player to a global one. ^{NL}

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Rooppur NPP will have a Multifunction Centre

Bangladesh delegation visits reference Russian nuclear site for practical knowledge. This is the second visit of Bangladesh experts since the beginning of the year.

A five-member Bangladesh delegation comprising experts from Bangladesh Atomic Energy Commission (BAEC) and other involved organizations visited the Novovoronezh nuclear power plant (NPP) in Russia, which is the reference project of the Rooppur NPP, to gather required knowledge and experience in establishing

the Information Center of Rooppur Nuclear Power Project.

The program included a visit to the Novovoronezh NPP information center, a guided tour at the Unit 6 of the Novovoronezh NPP, acquaintance with social infrastructure of the city for nuclear professionals.

“The main objective of the visit was to understand the construction process of the Novovoronezh NPP multifunction center. We have learnt about what things are required and what methods should be adopted to provide necessary information to the people in a smart manner,” Md Ahmed Nasir, Chief Engineer and the Director - Engineering of BAEC said.

The officials of the Novovoronezh Information Centre briefed the delegation about construction process and functioning



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of the Multifunction Centre with a permanent Information Centre within its framework. The Rooppur NPP Authority is moving forward with a plan to construct a similar Multifunction Centre near the Rooppur site.

In late April, a Bangladeshi delegation already visited the Novovoronezh II NPP. The visit included attending the reactor and turbine islands, central control room, training center, and the cooling tower. Members of the delegation asked questions about safety and technical features of the reactor. Following the visit, Shafiqul Islam, a member of the delegation and Chairman of the Nuclear Engineering Department at the University of Dhaka, said, **“It is significant for us to practically see the reference project of our Rooppur Nuclear Power Plant. The visit has helped me to gain more confidence in the technology that has been chosen for our maiden nuclear power facility.”**

Construction of the Rooppur NPP is one of the best examples showing how Russia and Bangladesh cooperate. Commenting on positive trends in trade and economic ties between the two countries after a meeting with Abul Kalam Abdul Momen, Minister of Foreign Affairs of Bangladesh, in late April, his Russian counterpart Sergey Lavrov said, **“Last year (2018), trade turnover between our countries exceeded USD 1.6 billion, almost approaching the record high of 2017. We agreed to continue developing our economic ties through a broader involvement of the Russian-Bangladesh Intergovernmental Commission on**

For reference:

Featuring two Russian-designed Generation III+ VVER-1200 reactors with a total capacity of 2,400 MW, the Rooppur Nuclear Power Plant is constructed 160 km away from Bangladesh’s capital Dhaka. The general construction contract was signed in December 2015. The first concrete ceremony at Unit 1 was officially held in November 2017. First concrete for the foundation of Unit 2 was poured in July 2018.

Trade, Economy, Scientific and Technical Cooperation.”

The Rooppur NPP will become an important driver of social and economic development of Bangladesh and make a sizable contribution to the country’s energy mix. In 2018, Bangladesh’s power generation capacity reached 20,000 MW. The Bangladesh government is planning to generate 24,000MW by 2021 and 40,000MW by 2030.

Bangladesh also plans to produce 9% of its electricity using nuclear power and reduce its dependence on fossil fuels by the middle of the next decade.

During the parliamentary hearings in early 2019, Nasrul Hamid, State Minister for Power, Energy and Mineral Resources of Bangladesh, said that the entire territory of the country would have access to electric power by the year end. 

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Trillion Dollars in Five Years

Nearly USD 1 trillion will be invested in the energy sector of the Middle East and North Africa (MENA) within the next five years (2019–2023). This conclusion was made by the Arab Petroleum Investments Corporation (APICORP), one of the largest financial institutions in the MENA region, in its annual survey.

According to the survey, industry analysts have upgraded their forecast for investments

in the regional energy sector by 5% as compared to the previous year.

Power generation accounts for the largest share in these investments (USD 348 billion), with the current projects in the sector amounting to USD 90 billion. Investments in other sectors will total USD 304 billion (oil production), USD 186 billion (gas production), and USD 123 billion (petrochemicals). All in all, the energy industry in the MENA region will acquire USD 961 billion in investment within the next five years.

Taken separately, the power sector constitutes 36% of total investment, which is explained,



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according to the survey, by growing demand for electricity in the region and accelerated development of renewable power sources.

Renewables account for 34% of money to be invested in the power sector, and more than a half of this amount will go to North African countries.

Saudi Arabia leads the list of announced power investments. The survey explains the country's ambitious plans by the intention to diversify its electricity generation mix with considerable renewable and nuclear capacity. **“Nearly USD 50 billion of projects currently stand at the design and contract award phase,”** APICORP experts said in their report.

Similar trends are observed in Egypt: almost a third of announced investments into the power sector will be channeled into the construction of renewable power plants and a nuclear power plant at El Dabaa.

According to the current plans, Saudi Arabia will invest USD 148 billion in the energy sector by 2023. Egypt's investments in the energy sector will amount to USD 118 billion.



Saudi Arabia has the largest committed and planned investments in the medium term, APICORP says. Egypt will prioritize upstream gas and power sector investments to meet its rising demand for electricity.

APICORP concludes that governments of MENA countries will prioritize critical investments in their energy sectors. **“The majority of MENA countries will see a greater transition in the energy sector from oil to gas, expansion of the downstream and petrochemicals sectors, and significant power generation capacity additions, including a surge in renewable energy,”** authors of the report say. ^{NL}

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