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## ATOMEXPO Highlights

**In April, the southern Russian city of Sochi hosted the 11th International Forum ATOMEXPO attended by representatives of 74 countries. For the first time ever, it welcomed guests from Nicaragua, Qatar and the Dominican Republic. Discussions at the Forum focused on the future of low-carbon economy, commitment to the environment and natural resources, investments in sustainability, and the role of nuclear in achieving the UN sustainable development goals.**

ATOMEXPO has transformed itself from a national industry event attended by foreign colleagues into a global discussion

platform, Rosatom Director General Alexey Likhachev said. This was the reason why this year’s business agenda was drawn up by an international program committee that comprised William Magwood, Director General of the OECD NEA, Luis Echávarri, former Director General of OECD NEA, Agneta Rising, Director General of the World Nuclear Association, Jacques Regaldo, Chairman of the World Association of Nuclear Operators, and others.

The plenary session of the Forum centered on the use of nuclear technology for a better future and achievement of the 17 Sustainable Development Goals set by the UN in 2015. Sergey Kirienko, First Deputy Chief of Staff of the Presidential Administration of Russia and Chairman of the Supervisory Board of Rosatom, said, **“The UN Sustainability Development Goals aim at solving two global tasks, eradicating poverty and**



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preserving the environment. Neither the first, nor the second problem will be solved without sufficient energy, and nuclear can play a key role here. Civil nuclear power is environmentally safe and reliable. Besides, it contributes to the development of science, education, medicine and agriculture and helps to overcome the shortage of drinking water. And I cannot but mention the impetus that construction of a nuclear power plant gives to the national economy.” According to Sergey Kirienko, 10 GW of new capacity was commissioned around the world in 2018, and 5 reactor units resumed their operation in Japan, thus breaking a 30-year record. Rosatom and its partners accounted for 40% of the new capacity.



Thomas Gerassimos, Deputy-Director General for Energy of the European Commission, said that Europe committed itself to reducing carbon dioxide emissions down by 35-45% until 2030, but the goal could not be possibly achieved without nuclear power. Alexey Likhachev also drew attention of the audience to the role of nuclear in curbing CO2 emissions and noted, **“We do not stand still and keep working on ‘closing’ the nuclear fuel cycle, improving safety**

**of nuclear power plants, and recycling nuclear materials. This will make nuclear generation even safer for the environment.”**

Representatives of newcomer countries, Uzbekistan and Zambia, also took part in the plenary session. Zhurabek Mirzamakhmudov, Uzbekistan’s First Deputy Minister of Energy and Head of the Agency for the Development of Nuclear Energy (Uzatom), said that the country’s decision to embark on a civil nuclear energy program was purely economic. He added that country did not plan to give up on gas or renewables, but the population of Uzbekistan is growing fast, and nuclear energy is essential to satisfy the energy demand. Civil nuclear energy is a multi-year guarantee of secure energy supply and development of related industries, science and talents.

Roland Msiska, Head of the Zambia Atomic Agency (ZAMATOM), told the audience that the country had faced a severe drought in 2015, and hydropower plants generating 40% of power in Zambia could not produce enough electricity. The country’s gross domestic product fell by 40% that year. According to Msiska that was a strong blow for country’s economy. Zambia had to change its energy mix and decided to begin with a research reactor and then building a commercial nuclear power plant in 10 or 15 years. Medicine is another area that cannot do without nuclear technology. Besides, Zambia will need isotopes and irradiation solutions for its produce.

**ATOMEXPO BROKE A NEW RECORD WITH OVER 40 AGREEMENTS SIGNED. THIS ISSUE WILL TELL YOU ABOUT ONLY SOME OF THEM. SEE THE NEXT ISSUE TO FIND OUT MORE.**

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### ROAD TO A NUCLEAR POWER PLANT IN ETHIOPIA

Russia and Ethiopia had approved a three-year roadmap for cooperation in design and development of a nuclear power plant and a nuclear science and technology center, staff training, and building a positive image of nuclear energy in the country. The document was signed by Alexey Likhachev, Director General of Rosatom, and Getahun Mekuria Kuma, Minister of Innovation and Technology of Ethiopia.

Our readers might remember that Rosatom and the Ethiopian Ministry of Innovation and Technology signed a memorandum of cooperation in civil nuclear technology on June 19, 2017. The memorandum established a legal framework for the joint cooperation between a number of research and technology areas, such as nuclear infrastructure development, nuclear energy awareness programs, irradiation technology in industry, agriculture and medicine, and staff training.

### STAFF FOR CUBA

Rosatom and the Cuban Ministry of Science, Technology and Environment signed a memorandum of cooperation on staff training for the nuclear industry. The memorandum was signed by Nikolai Spasskiy, Rosatom's Deputy Director General for International Relations, and Fernando Gonzalez Bermudez, First Deputy Minister of Science, Technology and Environment of Cuba.

The document provides for the development of nuclear staff training programs, academic and professional exchange, development of textbooks and technology manuals, short-term internships, summer schools and seminars.

### A WIN-WIN IN SERBIA

Russia and Serbia signed two memorandums of understanding. The first one covers staff training, while the other establishes principles of building public support for nuclear energy. The documents were signed by Rosatom's Director General Alexey Likhachev and Serbian Minister of Innovations and Technology Nenad Popović. He said that it was an opportunity for Serbia to tap into to the Russian professional expertise in nuclear technology and promote academic research in Serbia together. It is planned to establish a nuclear science and innovative technology center in association with Rosatom. This will be the most advanced nuclear center in Southeast Europe and an educational institution for nuclear professionals from around the world.



As part of human resource development, the two countries will introduce staff training programs, organize academic exchange, train lecturers for Serbian students, etc. The parties plan to launch a number of nuclear awareness raising initiatives, organize international conferences, exhibitions, social and educational projects, and many others in order to build public awareness of nuclear technology.



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As you might remember, Russia and Serbia signed a set of agreements on January 17, 2019 aimed at establishing a legal framework for joint civil nuclear programs and initiatives. The documents include an agreement on cooperation in proven and innovative nuclear energy technologies and a declaration of strategic partnership to build a nuclear science, technology and innovation center.

## NUCLEAR SCIENCE AND TECHNOLOGY CENTER IN CONGO

Nikolai Spasskiy, Deputy Director General for International Relations at Rosatom, and David Maduka, Congo Ambassador to Russia, signed a joint roadmap document. Within the next two years, the parties will consider an opportunity to build a nuclear science and technology center and lay a foundation for staff training. 



The Arctic Forum brought together over 3,000 researchers, experts, government officials and representatives of international businesses and organizations. The event was also attended by Russian President Vladimir Putin and leaders of Nordic countries.

The Arctic currently accounts for more than 10% of total investments made by the Russian Government, Putin said at the plenary session. And this share will definitely grow. For the Arctic to become an attractive investment destination there must be a well-developed infrastructure, particularly the Northern Sea Route (NSR), which is the shortest way between Northern Europe and the Far East. It is a viable alternative to the Suez Canal: the traveling distance from Murmansk (Russia) to Yokohama (Japan) via the Suez Canal is 12,500 nautical miles while the same trip through the NSR is just 5,770 miles.

In December 2018, Rosatom has been appointed as an operator of the NSR infrastructure. Speaking at the Arctic Forum, Rosatom’s Director General Alexey Likhachev announced plans to increase freight traffic on the Northern Sea Route to 92.6 million tons by 2024. These plans are even more ambitious than 80 million tons’ target set by the Russian president.

### Facts & Figures

650+  
PARTICIPATING COMPANIES

4,000+  
DELEGATES AND GUESTS

290+  
RUSSIAN AND FOREIGN MEDIA

## Arctic Calling

**On April 9-10, 2019, Saint Petersburg hosted the 5th International Arctic Forum dedicated to the prospects of developing Arctic regions.**



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**“Our goal is to increase traffic considerably. Last year’s cargo traffic on the Northern Sea Route reached 20 million tons. It is three times higher than the Soviet-time record of 1987,”** Putin said.

According to Alexey Likhachev, the plan for 2024 is to transport 41 million tons of gas (liquefied natural gas and gas condensate), 23 million tons of coal, 17.1 million tons of oil, 8 million tons of railway cargo, and 3.5 million tons of other cargo, making a total of 92.6 million tons.



**“This is not our fantasy, but carefully calculated figures. Much needs to be done to make the dream come true. Rosatom has a lot to do in organizing sea traffic and constructing new icebreakers while transportation companies and agencies are expected to provide infrastructure and port facilities for cargo handling. If oil and gas**

**producers do not see that we are ready to transport hydrocarbons they extract, they will not develop oil and gas deposits as fast as they can. In this situation Rosatom is an embodiment of government guarantees for hydrocarbon producers, who make huge investments in Arctic projects,”**

Rosatom’s Director General said, adding that he expected the annual freight traffic on the Northern Sea Route to reach 110–120 million tons by the 2030s.

Alexey Likhachev also told the audience about the structure of the newly established NSR Directorate, **“Rosatom and the Russian Ministry of Transport have completed the process of dividing the management powers in respect of the Northern Sea Route. Port facilities and the ministry’s Hydrographic Survey Department were transferred to Rosatom. The Ministry of Transport is now responsible for regulatory aspects, while Rosatom will deal with commercial matters as an organization responsible for the Northern Sea Route federal project. Development of the Arctic regions and hydrocarbon deposits is the function of the Ministry for Development of the Russian Far East and Arctic.”**

Rosatom will set up a center of naval operations to coordinate sea traffic and develop regulations to harmonize activities of different government agencies operating on the Northern Sea Route.

According to Alexey Likhachev, investments in the NSR development project are estimated at RUB 735 billion (USD 11.5 billion) until 2024. The government will fund RUB 274 billion (USD 4.3 billion) of the project costs, with the rest to be covered by Rosatom and hydrocarbon producers, including Novatek, Rosneft and others.




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Russia will have at least nine nuclear icebreakers by 2035. For the time being, Atomflot (a Rosatom Group operator of the nuclear fleet) has four icebreakers and a lighter. The service life of their nuclear propulsion units can be extended at least until 2025. By that time, Atomflot will receive three new powerful icebreakers – Arktika, Sibir and Ural (launched on May, 25) – capable of traveling in both deep-sea waters and river estuaries. There can be more new ice-going ships as the decision has been made to start construction of the fourth and fifth icebreakers. The construction is planned to be financed by both the government and commercial loans.

Year-round navigation in the Arctic will be guaranteed when the first icebreaker of the Leader series is put afloat and commissioned. Such icebreakers will be two times more powerful than those now under construction and capable of breaking 4-meter thick ice.

Atomflot is expecting an approval from the Zvezda Shipyard. The plan is to build a total of 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.

Development of the Arctic will require new energy capacity. This is where Rosatom sees good prospects for using small and medium nuclear power plants. In the summer of 2019, floating nuclear power unit Akademik Lomonosov will be transported to the Russia’s northernmost port of Pevek. It will become a showcase technology that can be rolled out at other sites. Besides, Rosatom plans to develop other types of low capacity power plants, such as a two-unit plant with two 50 MW RITM-200 reactors, that can be constructed either as floating or on-shore facilities. 

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## Global Energy: Expert Analysis and Forecasts

**At the beginning of this year, major international companies and agencies (the IAEA, McKinsey, BP, the World Nuclear Association, etc.) laid out the current trends and main statistics of the global energy market.**

The Global Energy & CO<sub>2</sub> Status report by the International Energy Agency (IEA) informed us about current international trends in the field of fuels, renewables, efficient use of energy, and published data on carbon dioxide emissions. In general, the trend for growth of total energy consumption in the world continued. In 2018, the rate

reached 2.3% that is twice the pace of growth in 2010. These figures are due to the expansion of the global economy and volatile climate conditions leading to extra heating and cooling costs in some parts of the world.

Atomic energy production increased by 3.3%, or 90 TWh. Restarting four nuclear power plants after the accident at the Fukushima Daiichi NPP in Japan in 2011 and increased electricity generation in France, exceeding its own needs by 20%, added 38 TWh to the total amount. Switzerland, Taiwan, Pakistan and Sweden, having increased the production of electricity from nuclear power plants, massively contributed to the numbers, unlike South Korea and Belgium.

The IEA report stated that in 2018, carbon dioxide emissions reached a record of 33.1 billion tons, which is 1.7% higher than last





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year. During the period between 2014 and 2016, CO<sub>2</sub> emissions remained at the same level despite the rapid growth of the global economy. Whereas in contrast, in the 2017-2018 the dynamics has changed because low-carbon options were not scaling fast enough.

For the first time, the IEA assessed the impact of fossil fuels use on global warming. The report stated that CO<sub>2</sub> emitted from coal combustion was responsible for more than a 0.3 °C of 1°C of the average increase in worldwide yearly air temperature above pre-industrial level. This makes coal the single largest source of global temperature growth.

Worldwide management consulting firm McKinsey & Company in its report on energy perspectives confirmed the statistics of significant energy-related carbon emissions increase, which, according to their estimates, makes up to 60% of total global emissions and predicts their potential gradual increase until 2024.

The firm expects the share of energy received from nuclear and renewables in the total energy balance to rise from 19% to 34% and supply more than half of electricity by 2035 and 75% by 2050. This positive outlook envisages reduced carbon dioxide emissions due to declining coal demand.

The Energy Outlook made by the British multinational oil and gas company BP forecasts an overall growth of nuclear energy to 3400 TWh by 2040. By this time the energy demand will rise by a third, however, this growth rate will be much slower than in the last 20 years.

In one of the scenarios of the report, renewables are expected to become the fastest growing energy source (7.6% p.a.)

and the single largest source of global power generation by 2040.

Nuclear power is growing at an average of 1.1% per year, which is generally in line with the growth rate of the last 20 years. The report focused on the fact that the majority of nuclear power plants in developed countries being a part of the Organization for Economic Cooperation and Development (OECD) would be steadily decommissioned due to the late stages of lifecycle. On the other hand, the production of nuclear energy in China is expected to grow rapidly by 1000 TWh. Moreover, by 2040, China has a potential to have a capacity for the same level of nuclear generation as the entire OECD.



The World Nuclear Association (WNA) reported that about 450 nuclear power reactors produced around 11% of the world's electricity. About 60 more reactors are under construction, which is equivalent of about 15% of the existing capacity. In 2017, nuclear power plants supplied 2506 TWh of electricity compared to 2477 TWh in 2016. Construction of more than 25 reactors is to be completed in 2019-2020, which will definitely bring the world community closer to the goal of supplying 25% of electricity using nuclear by 2050.



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Every year, the Massachusetts Institute of Technology (MIT) presents a list of ten breakthrough technologies on the pages of its MIT Technology Review magazine. Bill Gates highlighted greenhouse gases emission problem and highlighted a dire need for sustainable energy production to prevent climate change. The magazine mentioned generation IV nuclear reactors, small modular reactors (SMRs) and fusion reactors as parts of the solution to global warming. One of the companies developing generation IV reactors, such as liquid sodium-cooled fast reactor, TerraPower joined research partnerships, aiming to showcase first results by the 2020s. Small modular reactors typically generate tens of megawatts of energy (for comparison, a conventional nuclear reactor produces about 1000 MW). NuScale in Oregon, which is developing light-water modular reactors with a capacity up to 300 MW, expects that SMRs might be able to reduce environmental and financial risks in the nuclear industry.

While the International Thermonuclear Experimental Reactor (ITER) is being built in the Cadarache center in southern France, companies such as TerraPower, General Fusion and Commonwealth Fusion Systems are making some progress in the field proposing new approaches in plasma confinement and its behaviour control inside the vacuum vessel.

The problem of reducing carbon dioxide in the atmosphere could be solved with the invention coming from Harvard. Climate scientist David Keith proposes to apply the principles of direct air capture to catch carbon dioxide emissions. According to the UN climate group, in order to prevent a dangerous increase in global temperatures, 1 trillion tons of carbon dioxide needs to be removed from the atmosphere in this century. Once the carbon is trapped, it can be utilized for the production of synthetic fuel, making methane or releasing carbon dioxide for sale to the carbonated soft drinks market. <sup>NL</sup>

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### ATOMEXPO-2019 IN PHOTOS



Sergey Kirienko, First Deputy Chief of Staff of the Presidential Administration of Russia and Chairman of the Supervisory Board of Rosatom



ATOMEXPO has become a global discussion platform



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## ATOMEXPO-2019 IN PHOTOS



The presentation of ATOMEXPO AWARDS-2019



Over 3.600 guests from 74 countries attended ATOMEXPO-2019