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Nuclear Cooperation And Atomic Competition

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Russia and China cooperate in many areas. Nuclear energy is a most developed and long-standing of these areas. This May, A. Likhachev, CEO of the Rosatom State Corporation, emphasized an unprecedented level of partnership: “No other country could boast such depth in the study of technologies and such breadth in the agenda of cooperation, starting from space energy solutions and ending with the construction of large nuclear power units in the territory of the People’s Republic of China”. China already has four VVER-1000 power units of Russian design in service, another four 1200 MW reactors are under construction at the Tianwan Nuclear Power Plant and Xudapu Nuclear Power Plant sites. But the nuclear industry of China has gained such high competencies and momentum that now it is ahead of Rosatom by the number of under construction and commissioned reactors.

Initially, China did not limit itself to one specific technology: it has nuclear stations, built to French, Canadian, Russian and American designs. Having gained versatile experience in the construction and maintenance of this entire set, Chinese experts

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started developing their own reactor designs, taking these to the global market and driving international competition.

Currently China is building 30 nuclear power units, and there are 58 nuclear reactors with the total installed capacity of 60,96 GW in service. “In terms of the overall scale of nuclear energy industry, China has for the first time ever taken the top position in the world”, - says the 2025 Report of the China Nuclear Energy Association (China's Nuclear Power Development Report – 2025). However, quantity does not always turn into quality. Chinese corporations do not yet have any sodium-cooled fast reactors or lead-cooled fast reactors, which are now operated by Rosatom, and also do not have the same amount of orders for NPP construction abroad. The first power plant based on a Chinese design is under construction in Pakistan.

However, there are several nuances that indicate that our unexpectedly formed competition has the hallmarks of a long-term mutually beneficial partnership.

The growth of global nuclear generation, in addition to clearly positive aspects, also leads to growing volumes of spent (irradiated) nuclear fuel (SNF), discharged from reactors. The issues of reprocessing spent nuclear fuel or its geological disposal remain to be fully resolved. Nuclear scientists from all over the world are struggling to solve them, and cooperation in this area is only welcomed. Nuclear power is based on such advanced scientific knowledge and a very narrow field of specialists, that every talent and every project complement each other, creating a synergistic effect.

Following the results of the “World Atomic Week – 2025”, held in late September in Moscow, Rosatom joined an underground radioactive waste disposal project, being implemented in China, for the waste which cannot be recycled now. The project in question is named "Methods for monitoring and evaluating hydrological response during mining operations in the Beishan underground research laboratory". Now experts of the Russian state corporation will be able to take part in a full range of hydrogeological studies at the construction site for the underground research laboratory, which is useful in terms of gaining experience by Russian experts as well. Russia is implementing a similar underground research laboratory project in Krasnoyarsk Region. Both facilities are located in the same geological formations.

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However, disposal of the most highly radioactive part of spent nuclear fuel is only one of the options for solving the problem. Spent nuclear fuel can be reprocessed and reused in reactors. And this technology has been best mastered by Russian Rosatom specialists: Russia is building fast neutron reactors (also called “breeders”), sodium-cooled or lead-cooled (BN-600, BN-800, BREST-OD-300). These reactors not only burn up SNF, including its most hazardous components (minor actinides), which until now could not be recycled and needed to be buried, but also generate new fuel. The opportunity to generate more potential fuel than is consumed means a solution to short supply of Uranium–235, currently in use at all operating NPPs. Introduction of such reactors will mean closing the nuclear fuel cycle (CFC) and transitioning to a new era of nuclear energy. And this technology is only available in Russia.

Back in 2023 the Rosatom State Corporation and China Atomic Energy Authority signed the Comprehensive Program for Long-Term Cooperation on Fast Neutron Reactors and Nuclear Fuel Cycle Closure, and a relevant roadmap was developed in 2024. China is following its own path to developing a closed nuclear fuel cycle, but cooperation with Russia is on the table. For China, this is a chance to make a technological breakthrough in this area and reduce decades of costly in-house research, and for Russia it would be an opportunity to establish its standards as global. It is expected that a Chinese demonstration CFC project will be unveiled in 2035.

Full cooperation and partnership are not mutually exclusive with the competition between China and Russia in the area of nuclear reactor construction globally; and this competition will only intensify. The first major confrontation took place this summer when Kazakhstan was selecting a contractor to build the country’s first modern high-power nuclear power plant. Several potential suppliers of nuclear technology were considered, including Chinese CNNC, South Korean KHNP, Rosatom and French EDF corporations. Rosatom won the competition: Kazakhstan’s first NPP will be based on two VVER-1200 units. Reactors of the type are in service in Russia and Belorussia, are being constructed in China, Turkey, Bangladesh and Egypt, Hungary is making preparations for construction of such a reactor.

But despite the fact that Rosatom makes most advantageous offers and has extensive construction experience, China is also reinforcing its positions. It is expected that the second and the third NPPs in Kazakhstan will be built by a Chinese company. As a long-term goal, Astana is considering construction of three nuclear power stations, including the option of implementing small modular reactors.

Small Modular Reactors (SMR) are yet another promising area in nuclear power. All Nuclear Club countries are focused on building these, but only Russia and China have such units in operation. China’s first HTR-PM small reactor went into service in

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2021. But it became the world’s second existing small reactor after the “Akademik Lomonosov” Russian floating nuclear power plant.

HTR-PM, a Chinese High-Temperature Gas-Cooled Reactor, the pride of China’s nuclear science, is predominantly a Chinese development, based on a German legacy design. However, Russia is also providing assistance in the development of the reactor range, conducting full-scale tests of Chinese design elements at our own sites.

Rosatom is ready to help anyone who wants to develop nuclear energy, and it is not afraid of any competition. In the opinion of the head of the state corporation, Russia will win “in any competition, just because no other company in the world can match the depth of its nuclear technologies, in terms of depth of scientific validity, breadth of competence and scale of activities”, as he said in an interview to Russia 24 TV channel.

In response to a question about the fear of losing one's advantages as a result of transferring competencies to foreign companies, he explained: “We are constantly improving our technologies. In this sense, we have no fear that by transferring these projects to other countries for implementation, we are nurturing our own competitors. Our fundamental science, our applied science, the tasks set by the President and the government <…> enable us to advance nuclear technologies at an accelerated pace, and in fact, lead entire countries in many modern solutions”.

Ultimately, the combination of cooperation and constructive competition stimulates scientific progress, creating a synergistic effect that is beneficial for all participants in the process.

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