



01.

STORIES

Tianwan 7 Nears Completion
Regular NSR Transit
Rosatom's Summer of Science



02.

TRENDS

Nuclear Investment Must Triple



Tianwan 7 Nears Completion

On August 12, 2026, the start-up process began for Unit 7 of China's Tianwan Nuclear Power Plant, currently under construction with Rosatom's input. The first fuel assemblies were loaded into the reactor core. This milestone brings another unit at one of China's largest nuclear power plants closer to grid connection. Three more units – Tianwan 8, and Xudabao 3 and 4 – are next in line.



“Startup operations have commenced at Tianwan Unit 7, marking a key milestone in the project's implementation. Following hydraulic tests and heat-up, the reactor will be gradually brought to zero-power criticality to verify and test the performance of the control and protection systems, as well as the neutronic properties of the nuclear fuel. When all these stages are completed, the plant will proceed to the first electricity phase, which includes synchronization of Unit 7 with China's power grid,” said Alexey Bannik, Vice President for Chinese and Advanced Projects at AtomStroyExport. Following grid synchronization, the unit's power output will be increased step-by-step to 100%.

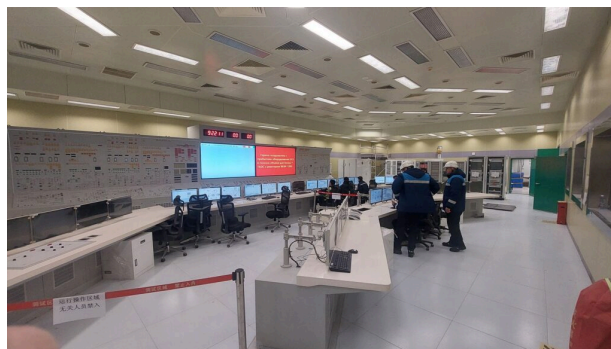
Also in August, cold functional testing was completed on the equipment of Unit 8 as part of the commissioning program, with preparations now underway for hot functional testing, which will commence this autumn. The reactor is scheduled to go critical in 2027.

The Tianwan Nuclear Power Plant is the largest economic cooperation project between Russia and China. Four Russian-designed VVER-1000 units at Tianwan are already supplying millions of kilowatt-hours of electricity to the national grid. In 2018, an intergovernmental protocol and a framework contract were signed for the construction of Units 7 and 8 equipped with VVER-1200 reactors. Under these agreements, Russia designed the plant's nuclear island and is supplying key equipment for both units, while also providing design supervision, installation oversight, and commissioning support.

Construction of Tianwan Unit 7 and Unit 8 started in 2021.

Progress at Xudabao

Rosatom is also participating in the construction of two VVER-1200 units at the Xudabao Nuclear Power Plant. At Unit 3, hot functional testing of the equipment was completed in early June, and engineers have since begun equipment inspections. In August, the Kurchatov Institute and the Specialized Research and Design Institute for Instrumentation Engineering (SNIIP, part of Rosatom) successfully completed the first phase of integration testing for the control, management, and diagnostic system supplied by the institute, alongside the main control system. Unit 3 is scheduled to proceed to first criticality by the end of 2026.



Equipment installation at Unit 4 is nearing completion, with cold functional testing scheduled to begin before the end of the year. Nuclear fuel loading

into the reactor is expected in the second half of 2027.

Broader cooperation

Russian and Chinese nuclear professionals are also collaborating on the development and deployment of fast neutron reactor technologies. Notably, Rosatom's fuel division has supplied fuel for the initial core loading of the CFR-600 fast reactor.

Scientific collaboration is also expanding. In December 2025, Shanghai ZDAN International Co. joined the International Research Center consortium, which will operate the MBIR multipurpose fast neutron research reactor, as a core member. In April of this year, the Institute of Plasma Physics at the Chinese Academy of Sciences signed a cooperation agreement with the consortium's lead organization.

Mutual interest also extends to logistics, particularly cargo shipping via the Northern Sea Route. Chinese companies were the first to launch regular container transit services between Chinese and Russian ports. Furthermore, the two countries are actively cooperating in nuclear medicine and materials science.

Photo by: ASE JSC; NCCP



Regular NSR Transit

The Northern Sea Route (NSR) and, more broadly, the Trans-Arctic Transport Corridor are rapidly transforming into a major global maritime trade artery. This is evidenced by the launch of regular transit cargo services from China to Europe and a test voyage from South Korea. Other Global South nations are also looking to launch cargo operations via the NSR.



Chinese ocean carrier Sealegend Shipping launched regular services this year between the Chinese port of Ningbo-Zhoushan and European ports via the Northern Sea Route. In August, the container ship Dubai Tower, loaded with batteries, photovoltaic modules, and other electric equipment, set sail for Felixstowe (UK), Rotterdam (the Netherlands), Hamburg (Germany), and Gdynia (Poland). This marked the inaugural voyage of the China-Europe Arctic Express (CAX) service. The Dubai Tower entered NSR waters on August 28 and exited on September 3, traversing the route in less than a week.

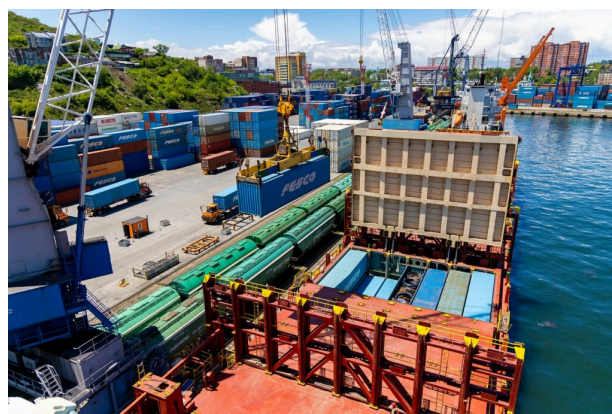
This year, seven vessels are expected to complete a total of eight voyages through NSR waters, operating on a weekly schedule from August to October, when the entire route offers the most favorable ice conditions. All vessels have obtained the mandatory transit permits from Rosatom, the NSR infrastructure operator.

The test transit voyage that prompted Sealegend Shipping to establish the regular service was carried out in September–October 2025. The container ship Istanbul Bridge traveled from Ningbo-Zhoushan to Felixstowe in a record 20 days.

Cargo services via the NSR between China and Russia were launched even earlier. Thirteen years ago, the cargo ship Yong Sheng became the first Chinese vessel to reach Europe via this route. More recently, in 2026, the container ship Xin Hai 1, operated by NewNew Shipping Line, delivered 500 containers of automotive components to Murmansk. In early September, the vessel was loaded with

potash fertilizers for its return voyage.

In August of this year, NewNew Shipping Line CEO Ke Jin announced plans to deploy six new ice-class container ships, each with a capacity of 4,800 TEU (twenty-foot equivalent units), on the NSR. Four of these vessels are scheduled to begin operations in October on the route between Chinese and Russian ports. Along with the existing fleet on this route, they will ensure two sailings per month. The remaining two container ships are slated for deployment in June 2027.



Furthermore, Russia and China aim to increase bilateral cargo traffic via the Northern Sea Route to 20 million tonnes by 2030.

South Korean debut

Following the Chinese carriers, South Korean ships have also begun transporting cargo via the NSR. South Korean ocean carrier Panstar Line recently

launched its inaugural NSR voyage. Its container ship, Panstar Acro, spent less than seven days in NSR waters, exiting the route on the morning of September 6.

Busan Mayor Chun Jae-soo noted, “The Northern Sea Route is already commercially viable. Therefore, the Lee Jae-myung administration fully understands the critical importance of seizing the moment and taking proactive steps through close coordination among the government, the private sector, financial institutions, and port authorities.”

Interest from the Global South

Other nations are also showing interest in maritime shipping via the NSR. In August, Venkatesapathy Shivaperumal, Joint Secretary at India’s Ministry of Ports, Shipping and Waterways, said at the Arctic Regions forum in Arkhangelsk, Russia, that the country is keen to collaborate on the Trans-Arctic Multimodal Transport Corridor and sees much potential in NSR cargo operations. According to him, India’s first voyage via the NSR could take place in 2027.

In May 2026, Vietnam signed a maritime cooperation roadmap with Russia, extending through 2030. The document outlines coordinated efforts regarding the use of the Northern Sea Route.

Furthermore, major international port operators are also demonstrating a keen interest in Arctic logistics. A Russian government commission has approved the establishment of a joint venture between Rosatom and UAE-based DP World. Rosatom will contribute its shares in the FESCO Group to the joint venture, while DP World will provide cash investment. The new enterprise will focus, in particular, on developing cargo operations along the NSR.

All these examples demonstrate that leading players in global maritime logistics view NSR shipping as a distinct competitive advantage.

Shorter, Safer, More Efficient

Two key factors support this Arctic shift: the route from Asia to Europe via the NSR is shorter than the Suez Canal route, let alone the passage around Africa. Additionally, the Arctic route offers shipping companies a reliable alternative amid ongoing geopolitical tensions along traditional southern maritime corridors.

For their part, Russian government agencies—including Rosatom in its capacity as the NSR operator—are actively driving efforts to upgrade NSR infrastructure and enhance navigational safety. The Russian space agency Roscosmos is launching satellites for space-based Arctic monitoring; the Ministry of Emergency Situations is deploying a network of emergency rescue centers in the Arctic; and regional governments alongside private businesses are upgrading port infrastructure and building new terminals.

The core elements of Russia’s Arctic transport infrastructure have been developed over decades, and today the country remains the only one in the world capable of serially building powerful nuclear icebreakers using its proprietary technology. Rosatom continues to advance this capability. The existing fleet of state-of-the-art Project 22220 icebreakers (Arktika, Sibir, Ural, and Yakutia) will be joined in the coming years by the Chukotka, Leningrad, and Stalingrad. These icebreakers boast unparalleled performance: they can break through ice up to three meters thick, ensuring safe navigation across Arctic seas. Their reactors can operate for up to seven years without refueling. Furthermore, nuclear icebreakers produce virtually zero carbon emissions, making them an environmentally neutral form of maritime transport. Additionally, the Project 10510 icebreaker Rossiya, which will be the most powerful in the world, is currently under construction.

Since 2018, Rosatom has served as the administrator of the Northern Sea Route. Its mandate includes organizing safe vessel operations within NSR waters, providing icebreaker escorts, ensuring navigational and hydrographic support, and managing the permitting system. Under the current operating model, specific transit conditions are established for each vessel, including the requirement for icebreaker escorts in designated areas based on real-time ice conditions.

Together, these measures are making navigation along the Northern Sea Route increasingly predictable, safe, and fast—and therefore commercially viable. The business community is placing growing confidence in this transport corridor. Ultimately, the greatest rewards will go to those who secure a strong foothold along the route.

Photo by: FSUE Atomflot; FESCO Transport Group

Rosatom's Summer of Science

The summer months proved highly productive for Russian science. In July and August, researchers implementing the national quantum computing roadmap, supervised by Rosatom, announced new breakthroughs in quantum technologies. Additionally, Rosatom completed construction of a major megascience facility – the Siberian Circular Photon Source (SKIF) shared-use research center – in Novosibirsk.



Rosatom oversees the implementation of the Quantum Computing roadmap, which brings together research teams from universities and research institutes across Russia.

In July, Russian physicists reported significant advances in photonics. Notably, research teams led by Igor Bilenko and Dmitry Chermoshentsev became the first in Russia – and among the first globally – to develop a compact, on-chip source of “squeezed” light.

“We are in the vanguard of countries and companies achieving tangible results. Our immediate plans include developing quantum computing systems based on squeezed light and applying our expertise to create new detectors, including those for biological applications,” said Dmitry Chermoshentsev, Head of Research Groups at Rosatom Quantum Technologies and the Quantum Center.

That same month, physicists from the Quantum Center, ITMO University, and the Moscow Institute of Physics and Technology (MIPT) demonstrated for the first time that the collective behavior of electrons in an ultrathin material – a tungsten diselenide monolayer – can be observed using light. Their findings were published in the *Physical Review B* journal. “In our experiment, electrons in an atomically thin semiconductor align into a regular structure, and its formation alters the material’s optical response. This provides the scientific community with a new tool for studying quantum states where a large

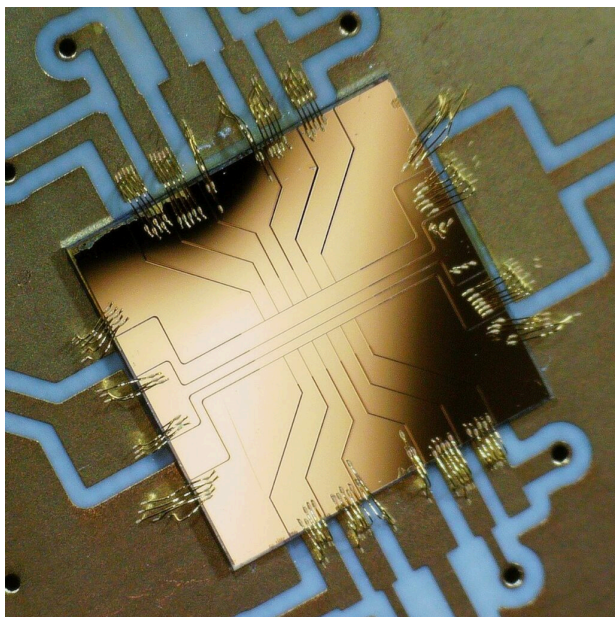
number of particles behave as a single entity,” noted Alexander Chernov, a co-author of the study and Head of the Research Group at the Quantum Center and MIPT. Typically, such states are studied via electrical measurements or in strong magnetic fields. The key advantage of the optical approach is that it allows for nearly non-contact observation of electron states. Looking ahead, these 2D structures could serve as the foundation for solid-state quantum simulators.

In August, research teams led by Ilya Semerikov at the Lebedev Physical Institute of the Russian Academy of Sciences (LPI RAS) and Kirill Lakhmanský (RQC) reported further breakthroughs in developing ion-based quantum processors. The scientists successfully demonstrated the trapping of ytterbium-171 and calcium ions in planar traps, along with ion transport and single-qubit operations. Researchers at the LPI RAS also measured the ion heating rate, one of the most critical performance metrics for planar traps. “The advancement of trapped-ion quantum computers is closely tied to the transition toward planar technologies. This opens up vast avenues for platform optimization,” explained Ilya Zalivako, LPI RAS Senior Researcher.

SKIF reaches full scale

The SKIF shared-use research center officially opened on August 11. The facility comprises a complex of 34 buildings equipped with advanced engineering and instrumentation systems, spanning a total area of about 90,000 square meters. The

center will host cutting-edge scientific research utilizing synchrotron radiation beams. "For Rosatom, this is far more than just a research center. First, it is a facility where our designers, general contractors, engineers, and construction workers worked side by side, proving that Rosatom is capable of delivering projects of any scale. Second, we view SKIF as a platform for addressing our strategic objectives," Rosatom Director General Alexey Likhachev said at the opening ceremony.



Rosatom is currently developing a joint research program with the Boreskov Institute of Catalysis (Siberian Branch of the Russian Academy of Sciences). The focus will be on studying melt structures and phase transitions – research that is critical for materials science. Rosatom is also particularly interested in the Izotop experimental station, which will enable the study of new materials and radiochemical processes essential for closing the nuclear fuel cycle and advancing nuclear medicine. "This is a direct contribution to the future of the nuclear industry and the nation's technological sovereignty," Likhachev emphasized.

The general contractor for the project was Titan-2, a construction holding company within Rosatom. The facility was designed by Rosatom's Central Design and Technology Institute (CDTI), which developed both the basic engineering and detailed design documentation, alongside an engineering data management environment to facilitate centralized collaboration on information and digital twin models of the facility. Within this digital environment, virtual and augmented reality technologies were piloted to support and streamline the construction process.

Photo by: Siberian Circular Photon Source (SKIF);
Russian Quantum Center; P. N. Lebedev Physical
Institute of the Russian Academy of Sciences

Nuclear Investment Must Triple

The World Nuclear Association (WNA) has published its inaugural World Nuclear Investment Guide (hereinafter the Guide). In it, experts estimate the industry's investment needs through 2050 at USD 6 trillion, outline the primary obstacles hindering capital allocation, and provide recommendations on what it takes for a nuclear project to secure funding.



As noted in the Guide, nuclear energy is becoming a cornerstone of national energy strategies after decades of uneven development. Three key factors are driving this trend. The first is the growing demand for clean and reliable electricity. The second is the imperative for national governments to ensure energy security. The third is the surge in power demand driven by electrification, industrial expansion, and the proliferation of data centers.

According to forecasts by the International Energy Agency (IEA), electricity demand between 2026 and 2030 will grow 50% faster than in the previous decade, the report notes.

Based on WNA estimates and stated government plans, global nuclear capacity could reach 1,446 GW by 2050. Fifty countries plan to build nuclear power units (currently, nuclear power plants operate in only 31 countries). As of mid-2026, 80 units are under construction, and over 100 are planned or on order.

Commissioning and operating 1,446 GW of nuclear capacity will require nearly USD 6 trillion in investment over the next 25 years, averaging USD 250 billion annually. This is three times the current level of nuclear investment (USD 80 billion per year), yet represents just 2.6% of the USD 235 trillion required for the global energy transition. The Guide targets the nuclear industry toward attracting commercial financing: "Mainstream finance is presented here as the target model, but it is not the only viable model; many mature financing frameworks co-exist in support of nuclear

technologies, and not all require sustained access to private capital markets."

The lion's share (90.5%) of the nearly USD 6 trillion required over the next 25 years is allocated to nuclear power units. Specifically, over USD 3.54 trillion is needed to build large-capacity units, and over USD 1.52 trillion for small modular reactors. An additional USD 222 billion is required to support the long-term operation of existing units. Investment in the nuclear fuel cycle is comparatively modest at USD 240 billion. According to WNA experts, USD 85 billion will be invested in mining by 2050, USD 20 billion in conversion, USD 99 billion in enrichment, and USD 36 billion in fuel fabrication. The back-end management will account for 5.5% of total investment: USD 203 billion for decommissioning and another USD 117 billion for interim storage. All estimates are expressed in overnight costs and exclude interest during construction.

For these investments to materialize and the units to be built, long-horizon political support and a fundamental improvement in the investment readiness and capital market presentation of nuclear power projects are essential, the Guide says.

Legal foundation

The Guide outlines the legal prerequisites for financing nuclear projects. Crucially, the host country must have a nuclear liability law in place; otherwise, investors and insurers cannot accurately assess risks. The law must clearly define operator liability

and ensure access to the insurance market to cover nuclear incidents. “Adherence to the international nuclear liability conventions (Paris Convention/Vienna Convention and their supplementary compensation protocols) provides an internationally recognized baseline,” the Guide notes.



The host country must also have an independent regulator equipped with resources, authority, and expertise to issue permits and licenses through a clear, predictable approval process. Predictable licensing timelines are among the most critical indicators of a project’s feasibility and bankability, the authors explain.

The project owner and operator must be legal entities with transparent corporate governance structures and financial reporting. “Legal uncertainty about ownership, liability or regulatory jurisdiction creates risk that is not insurable and not priceable, and therefore not financeable,” the Guide states.

Roots of mistrust

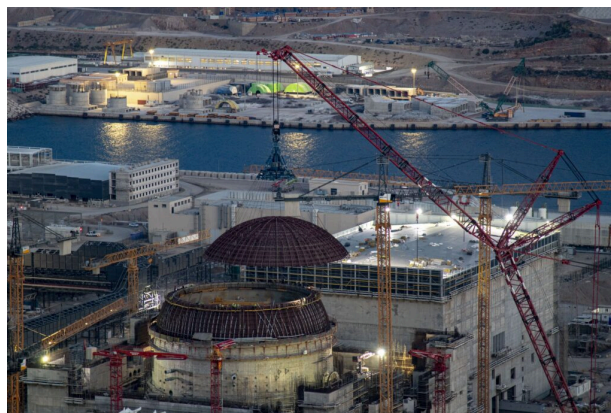
Nuclear projects and their stakeholders must inspire confidence among investors. However, achieving this is no easy task. “Compared with other mature infrastructure asset classes, nuclear lacks a standardized body of public data covering industrial, technical, commercial, regulatory and financing outcomes. This makes it harder for investors to benchmark projects and assess risks,” the report notes, highlighting a core challenge for the industry that must be addressed. “Nuclear will become a mainstream asset class not just through better projects and policies, but through co-development by industry and finance of the expertise and tools to assess and finance nuclear opportunities with greater speed and confidence,” said Dr. Sama Bilbao y León, Director General of the World Nuclear Association.

The authors of the Guide identified six parameters designed to enhance the appeal of nuclear projects to investors:

- Institutional support (timely decision-making and a continuous project pipeline in a growing nuclear sector).
- Standardization of reactor designs and supply contracts, alongside the harmonization of regulations across countries. Small modular reactors offer an ideal testing ground for these standardization efforts.
- Clear revenue mechanisms (long-term power purchase agreements, contracts for difference, etc.).
- Bankable risk that can be modeled, priced, and adjusted as new projects are deployed and market confidence grows.
- Mature supply chains.
- Liquid markets with the ability to enter and exit projects at various stages of development.

Comprehensive readiness

Investor caution is often triggered by insufficient maturity in one of three key project dimensions: technical, financial, and execution readiness.



The ideal scenario for a final investment decision requires the underlying technology to be at TRL-9 (proven in commercial operation), with licenses and contracts secured, comprehensive assessments and independent due diligence completed, safety measures implemented, and the organizational development plan aligned with technical and financial readiness programs. Regulatory licenses for construction and operation must either be issued prior to financial close or have highly predictable issuance timelines. Investor confidence is further bolstered by signed contracts —such as engineering, procurement, and construction (EPC) agreements and long-lead equipment supply contracts — as well as a clear understanding of the project’s governance structure, team commitment, future tariff

regulations, projected power revenues, creditor rights, and other key variables.

The authors emphasize that investment attractiveness and debt serviceability are complementary, not interchangeable, and outline specific requirements for securing both debt and equity financing. Equity investors, for instance, focus on exit strategies, such as cash flow distributions, refinancing, or secondary market sales. Lenders, conversely, scrutinize capital adequacy ratios, debt-to-equity ratios, reserve accounts meeting lender-mandated thresholds, and insurance coverage.

As a benchmark, the Guide provides creditworthiness metrics for nuclear projects, calculated using publicly available data on the financing of nuclear and comparable infrastructure projects. However, it notes that transactions in emerging markets or those backed by multilateral development banks may employ different coverage ratios and additional credit enhancement mechanisms, such as political risk insurance, sovereign guarantees, and robust reserve accounts.

To facilitate engagement with investors, the Guide introduces two practical tools. An investment readiness tracker allows project sponsors to verify whether all prerequisites for project presentation are in place. Additionally, a comprehensive checklist of investor documents and services – ranging from a brief teaser to a fully equipped data room – helps streamline communications at every stage of project development.

Photo by: Akkuyu Nuclear JSC; Getty Images /
Unsplash