

Kazakhstan's uranium bargain: Trading resources for technology

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Abstract

China and Kazakhstan have become increasingly important partners in the nuclear sector. Over the past two decades, their relationship has evolved from a focus on uranium extraction to broader cooperation in fuel processing, technology transfer and nuclear energy development.

For Kazakhstan, cooperation with China offers a way to move beyond exporting raw uranium and to build higher-value industries within the nuclear supply chain. For China, Kazakhstan is a vital source of uranium at a moment when Beijing is rapidly expanding its nuclear power program and seeking markets for its reactor technology. The partnership is mutually beneficial, but the two countries pursue distinct long-term objectives.

This paper maps the evolution of Sino-Kazakh nuclear cooperation, examines the interests that drive it, and considers the opportunities and risks that may emerge as the relationship deepens.

01 China's growing demand for uranium

China's expanding nuclear power program is creating a growing demand for uranium. The country's [15th Five-Year Plan for 2026–2030](#) reaffirmed a target of 110 gigawatts of nuclear generating capacity by 2030.

At present, [China's 61 operating reactors produce around 60 gigawatts of electricity](#), while a further 39 reactors under construction are expected to add another 41 gigawatts. Even if all current projects are completed on schedule, the fleet would reach only around 101 gigawatts, leaving a gap of roughly 9 gigawatts against the official target. China [has missed such targets before](#) (58 gigawatts by 2020 and 70 gigawatts by 2025 both went unmet), but construction continues at pace, with seven new reactors [expected to enter service in 2026 alone](#).

The supply picture explains why this matters for Kazakhstan. China's domestic uranium production has not kept up with its reactors: between 2008 and 2022, [output grew to](#)

[around 1,700 tons per year while demand rose to around 9,500 tons](#). The share of imported uranium rose from 44.9% of consumption in 2008 to 82.2% in 2022. The World Nuclear Association projects that China's requirements could exceed 40,000 tons per year by 2040. Securing long-term supplies from major producers has therefore become a strategic priority for Beijing, and no producer is larger than Kazakhstan.

02 Kazakhstan's energy ambitions and nuclear strategy

Kazakhstan's interest in nuclear power is driven by a widening gap between electricity supply and demand. Industrial growth and a rising population have increased pressure on an ageing energy system. In 2024, electricity demand reached [an estimated 17.2 gigawatts against available generating capacity of 16.6 gigawatts](#). By 2030, the deficit is projected to widen to 6.2 gigawatts. The government also faces pressure to reduce reliance on coal, which accounted for around 66% of electricity generation in 2025 and remains a major source of air pollution.

In January 2024, the government [adopted a target](#) of generating 5% of the country's electricity from nuclear power by 2035. Later that year, more than 70% of voters approved the construction of Kazakhstan's first nuclear power plant in a national referendum. Current plans [envisage](#) approximately 2 gigawatts of nuclear generating capacity by 2035 and around 4 gigawatts by 2050.

The program has expanded rapidly. Official strategy now calls for at least three nuclear power plants, with the possibility of a fourth. The first, to be built by Rosatom at Ulken on the shores of Lake Balkhash, is [expected to have a capacity of 2.4 gigawatts](#), cost approximately \$15 billion and enter operation by 2035. Chinese state-owned CNNC is widely viewed as the leading candidate for the second and potentially third plants.

Kazakhstan shortlisted four partners. It judged the CNNC and Rosatom bids the strongest and [dropped France's EDF and South Korea's KHNP](#). EDF was disqualified by its record of delays and budget overruns. KHNP could not offer a fully integrated fuel cycle. US agreements limit South Korea's ability to export enriched uranium.

Rosatom [won the first plant for three reasons](#): It has more experience operating reactors abroad than any rival. It has a reputation for delivering on time and on budget. And it offers loans backed by the Russian government, alongside a fully integrated fuel supply chain. Kazakhstan sees China as the cheaper long-term partner. But Rosatom makes the first project reliable, and external financing keeps it off the state budget, which is a priority.

CNNC leads the consortium for the second plant, and probably the third. The logic is diversification. Kazakhstan wants to avoid over-dependence on Russia, which carries its own geopolitical risk. China offers a second integrated fuel supply chain and a second set of partners.

Kazakhstan's nuclear ambitions extend beyond electricity generation. The government increasingly views a domestic nuclear industry as a driver of broader industrial and technological development, a shift reflected in [Kazatomprom's 2025-34 strategy](#). While uranium production remains the company's core business, the strategy places greater weight on using Kazakhstan's resource base to secure technology transfer, industrial partnerships and long-term economic development; expanding domestic capabilities in fuel fabrication, research and other stages of the fuel cycle rather than remaining a supplier of raw material. Kazatomprom increasingly treats uranium as part of a wider portfolio of critical raw materials that can be deployed to the same end.

Achieving these ambitions [will require more than constructing reactors](#). Kazakhstan must also develop a skilled workforce, expand domestic training programs, strengthen fuel fabrication capabilities and establish long-term solutions for radioactive waste management. Facilities such as the Ulba Fuel Assembly plant provide part of this foundation, but significant investment in expertise and supporting infrastructure will still be required.

03 From extraction to cooperation

China's [stated objective](#) is to obtain roughly one-third of its uranium domestically, one-third through overseas joint ventures and the remainder through international markets. While the country possesses extensive conversion and enrichment capacity, reliable access to raw uranium remains the binding constraint. This objective has been pursued through a network of state-owned companies and subsidiaries, such as CNNC, China General Nuclear Power Corporation (CGN), China National Uranium Corporation (CUC), CNNC International, CNNC Overseas, SinoU and CGN Uranium Resources Co. (CGN-URC). Kazakhstan has become one of their most important partners.

The first phase of cooperation focused overwhelmingly on securing access to uranium. In 2006, CGN and Kazatomprom signed a strategic cooperation agreement, followed in 2007 by a series of agreements covering uranium supply, fuel fabrication, Chinese participation in mining ventures and Kazakh investment in China's nuclear industry. The same year, CNNC and Kazatomprom signed their own strategic cooperation agreement. Chinese investment soon followed: CGN's subsidiary Sino-Kazakhstan Uranium Resources Investment Co. entered the Irkol and Semizbai mines, and [CNNC invested in the Zhalpak deposit](#). In 2010, CGN and Kazatomprom [signed](#) a long-term agreement for the supply of 24,200 tons of uranium over ten years.

A turning point came in 2014.

Rather than focusing solely on extraction, CGN and Kazatomprom established the Ulba-FA joint venture to develop a nuclear fuel fabrication facility at the Ulba Metallurgical Plant. Designed to produce up to 200 tons of fuel assemblies annually for export to China, the project marked Kazakhstan's first substantial move into a higher-value segment of the nuclear fuel cycle.

Cooperation deepened in the years that followed. In 2015, CGN-URC [acquired a 49% stake in the Ulba-FA joint venture](#), valued at approximately \$147 million, with Kazatomprom retaining the majority. CGN Mining also acquired a 49% stake in Semizbai-U. Construction of the Ulba-FA facility began in 2016 and was completed in 2020. That same year, CGN finalized an agreement first negotiated in 2007 by acquiring a 49% stake in Ortalyk LLP, operator of the Zhalpak and Central Mynkuduk deposits.

The relationship continued to expand beyond mining and fuel fabrication. In 2021, Kazatomprom signed new supply agreements with CUC and State Nuclear Uranium Resources Development Co. CUC also announced the construction of the Alashankou bonded uranium warehouse in Xinjiang near the Kazakh border, with an expected storage capacity of 23,000 tons, further strengthening the logistics linking Kazakh production to Chinese demand.

In 2025, CNNC was identified as the preferred contractor for Kazakhstan's second and third nuclear power plants. While Rosatom remains responsible for the first plant at Ulken, the decision indicates that Chinese involvement is expanding from extraction and fuel fabrication into reactor construction.

04 Using uranium to secure technology transfer

The evolution of Kazakhstan's nuclear strategy reflects a broader shift in how Astana approaches foreign investment. Rather than allowing market forces and commercial negotiation alone to determine what it gets from uranium extraction, the government is rewriting the rules to push foreign partners toward technology transfer and the development of domestic industrial capability.

This approach became explicit in December 2025, when President Kassym-Jomart Tokayev signed amendments to the Subsoil and Subsoil Use Code covering the uranium and hydrocarbon sectors. The reforms strengthened Kazatomprom's position by granting it priority rights over exploration licenses and allowing it to reserve prospective uranium deposits for future development.

The amendments also tightened the conditions for foreign participation. Uranium production licenses held by [Kazatomprom can now only be transferred to entities in which the company retains a stake of more than 75%](#), compared with 50% under the previous framework. Extensions of existing licenses and approvals for increased production have also become more restrictive.

Most significantly, some approvals are now linked directly to technology transfer. In certain cases, foreign partners must either accept overwhelming Kazatomprom ownership of a joint venture or provide uranium conversion and enrichment technologies to Kazatomprom or a jointly established enterprise. In effect, Kazakhstan is attempting to exchange access to its uranium for capabilities that would move it up the nuclear value chain.

The strategy carries risks. Shortly after the reforms were introduced, Canadian mining company Laramide Resources [suspended exploration activities in the Chu-Sarysu Basin](#), an early sign that stricter conditions may deter some investors.

Laramide points to a deeper problem. Kazatomprom faces declining reserves and struggles to renew its uranium resource base. That pressure pushes Kazakhstan toward protective policies, and those policies make the country less attractive to foreign investors in exploration. The company's chief executive, Marc Henderson, [called it a "de-facto nationalization" of exploration](#). Such a move could deter private investors other than Kazatomprom for years. But for Kazakhstan it looks essential. The state wants firm control over its own resources.

Kazatomprom's strategy [targets two coming problems](#). The first is depletion. The company expects its controlled reserves to run down by 2058, so it wants control of any deposit found from now on. The second is timing. That depletion arrives just as a global revival in nuclear energy is set to tighten uranium supply by 2030. Protecting the domestic resource is therefore critical. Kazakhstan would rather deter future investors, whatever their origin, than lose its competitive edge in a market where uranium only grows more strategic.

05 Beyond uranium: China's nuclear diplomacy

The Sino-Kazakh nuclear relationship also forms part of a broader Chinese effort to become a leading exporter of nuclear technology. At the center of this strategy is the Hualong One reactor (HPR1000), China's flagship third-generation design, promoted jointly by CNNC and CGN through Hualong International Nuclear Power Technology Co. China's export record so far is mixed: Pakistan [has two Hualong One reactors in operation](#) and a third under construction, while projects discussed in Argentina, Egypt and Kenya have moved slowly. The Bradwell B project in the United Kingdom [stalled](#) over political and national-security concerns.

Kazakhstan may become one of the most important future destinations for the technology. With CNNC the preferred contractor for the second and third plants, those projects are likely to be based on the Hualong One design.

From Beijing's perspective, exporting reactors offers benefits well beyond the construction contract. Chinese firms market complete nuclear packages combining reactor construction with fuel supply, fuel-cycle services, technical support, training and long-term operational cooperation, often backed by concessional financing and state loans. Nuclear plants operate for decades, so countries that adopt Chinese reactor technology may remain closely tied to Chinese companies for fuel, maintenance and expertise over periods of 20 to 40 years.

For Kazakhstan, this presents both opportunity and risk. Closer cooperation with Chinese nuclear firms could accelerate the development of the country's nuclear industry. At the same time, Astana's multi-vector foreign policy has traditionally sought to avoid excessive dependence on any single external partner.

06 Opportunities and risks of deeper integration

What began as a partnership centered on uranium extraction has evolved into a network of cooperation spanning fuel fabrication, reactor construction, technology transfer and industrial development. Recent developments suggest the process will deepen. During the second China-Central Asia Summit in June 2025, President Xi Jinping and President Tokayev [agreed to expand cooperation in the nuclear sector](#), while China pledged additional investment in mineral development, trade and transport infrastructure. Nuclear cooperation is increasingly embedded in a wider economic relationship rather than standing alone as a sectoral partnership.

China already accounts for a substantial share of Kazakhstan's uranium exports and is assuming a larger role across multiple stages of the nuclear value chain. As cooperation extends into reactor construction and long-term operational support, the challenge for Astana will be to ensure that closer cooperation does not harden into dependence. This dilemma is not unique to Kazakhstan: it is the central challenge facing resource-rich states seeking to convert foreign investment and technological partnership into development without surrendering strategic autonomy.

The Signpost

Sino-Kazakh nuclear cooperation is driven by a clear alignment of interests: China needs secure long-term uranium supplies and export markets for its reactor technology. Kazakhstan sees nuclear cooperation as a pathway to industrial upgrading and a larger share of the value chain. But the most important questions raised by the relationship remain open, and they should direct further inquiry.

The first concerns leverage. The December 2025 subsoil reforms show that Astana is no longer content to let market forces deliver technological development; it is actively trading access to uranium and other critical raw materials for technology, expertise and investment. Whether this works is unresolved. Early evidence suggests stricter conditions may deter some investors (see Laramide withdrawal), but Kazakhstan's weight as a supplier of uranium and other critical materials may yet strengthen its hand. Researchers should track whether these policies produce meaningful technology transfer or simply thin out the field of willing partners.

The second concerns dependency, and it cannot be answered by looking at China alone. Kazakhstan's nuclear future is now being built between two partners (Russia for the first plant, China for the next) while the Western and Asian democracies once discussed as possible vendors have dropped out of the picture. Where productive

interdependence ends and excessive reliance begins is a question policymakers in Astana will have to answer in practice; mapping the full structure of those dependencies, Russian as well as Chinese, is a task this paper leaves to future work.

Finally, the Sino-Kazakh case has relevance beyond the two countries. Similar patterns are emerging elsewhere in Central Asia as China expands its role in the region's nuclear sector, and the relationship deserves attention as a potential model for engagement between China and resource-rich states more broadly. For researchers, the task is no longer simply to count trade volumes, investment flows or uranium exports. It is to understand how resource wealth is being used as a bargaining tool, how technological dependence is created or avoided, and whether these new forms of industrial cooperation can genuinely help producing countries move up the value chain.

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