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July 2019

Levers of Power: Russia's Domination of the Global Nuclear Reactor Market

Since the 1940s, a central tenant of Russian foreign policy has been to take advantage of its bounty of natural resources to exert influence abroad. Russia is a major exporter of both natural gas and oil, and is the dominant supplier of energy to Europe. Much has been written about Russia's misuse of market power to exploit its consumers, particularly in the gas sector. Now, Russia's state owned nuclear power conglomerate Rosatom leads another sector of the global energy market: the design and export of nuclear power plants (NPPs). As Western companies retreated from the market, Russia continued to invest in both its domestic and foreign nuclear sector, quietly expanding the scope of its activities so that it now controls over 67% of the global nuclear reactor market.

After signing several major contracts with both China and India, as well as expanding the scope of its activities in the Middle East and South America, Western policy makers have begun to express concern over the strategic implications of Russian domination of this sector. Moreover, recent landmark nuclear deals between China and Russia are seen as evidence of a troubling Sino-Russian strategic alliance. This memo briefly outlines the state of the global nuclear reactor market and examines Russia's strategy in this sector, focusing on its contracts with China and Turkey. The analysis uncovers two main findings each with significant implications for how policy makers should view Russia's actions in this sector. First, although Rosatom's most extensive partnership is with China, there is little evidence to support the conclusion that its motives in China are not commercial. However, key differences in Rosatom's contracts with Turkey and several other consumers do raise flags, and warrant further investigation into the extent to which Russia's economic engagement in this field is purely commercial, or indeed part of a larger foreign policy strategy.

The Global Nuclear Reactor Market

Following the Fukushima disaster in 2011, nuclear power as a share of electricity generation worldwide fell sharply, but it had already been on the decline for several decades due to difficulty competing against alternatives including natural gas and renewables. But even as safety concerns prompted states like Germany to begin a nuclear power phase out, Russia named the export of nuclear power as a primary objective in its Energy Strategy up to 2035 and continued to invest in nuclear technology. Meanwhile, Western firms faced serious challenges. Pittsburgh based Westinghouse filed for Chapter 11 in 2017 (from which it has since emerged after major restructuring) and Japan's Toshiba and France's EDF and Areva have struggled to remain competitive on the global market.

But as Western firms receded from the market, the nuclear sector began to slowly rebound due to several factors. First, developing states see nuclear energy as a means of securing

indigenous energy production that allows them to move away from coal. Second, major energy exporters view nuclear power as a way of providing domestic energy supplies, thus saving their supplies for export markets that provide hard currency. Finally, even some OECD states have argued that nuclear power is a crucial component of any comprehensive energy plans that seeks to reach stated climate goals. The IEA estimates that there will be \$1.1 trillion in investment in nuclear by 2040, leading to an increase in nuclear power production of approximately 46%. However, this growth is extremely concentrated, with 93% of net production increases accounted for by China and India.¹

Despite this more favorable market environment, Western firms struggle to remain competitive. Because Western firms must answer to shareholders and are not generally subsidized by the state, they have been less successful at winning contracts than Rosatom, which is arguably the only “one stop shop” on the market. In addition to offering a complete range of nuclear goods and services, Rosatom is also the most prominent actor in the nuclear waste disposal business, meaning that it can offer its consumers a complete nuclear package: it can provide the nuclear fuel, design, construct, and run the nuclear power plant, and can then dispose of the fuel. Further, as will be examined below in detail, because its nuclear contracts are generally regarded as government-to-government agreements rather than private contracts, Rosatom is able to provide attractive financing packages to its potential consumers.

Subsidized by the state, Rosatom has expanded its export activities to a present order portfolio of over \$133 billion, with 35 signed contracts at various stages, representing approximately 67% of global reactor sales. The list of Rosatom’s consumers reveals its global ambitions. In addition to eight operating reactors in Ukraine, Iran, China and India, Rosatom is currently in the process of constructing eight more in China, Belarus, India, Turkey, Bangladesh and Iran. Eleven more reactors have been contracted in China, Bangladesh, Turkey, Finland, Iran and Armenia, and eleven more have been ordered in Egypt, India, Hungary, Slovakia and Uzbekistan. Various proposals and pending or on hold projects have been discussed or signed in India, Bulgaria, South Africa, Nigeria, Argentina, Indonesia and Vietnam. Finally, over the past two years Rosatom has signed preliminary agreements with Serbia, Bolivia, Saudi Arabia, Brazil, Japan and many others.²

Nuclear Contracts: How are NPPs sold abroad?

Russia’s use of contracts to sell its commodities abroad has been previously examined in scholarly work. However, the contractual structure under which Rosatom exports its NPPs has received relatively little scholarly attention. Most evaluations of Russia’s NPP export strategy have focused on the Build, Own, Operate (BOO) model, which Russia signed as a test case with Turkey for the Akkuyu NPP. Under this contractual model, Rosatom provides everything including financing, education, training, construction, fuel, and waste disposal. This model is marketed towards states with no previous nuclear experience, as Rosatom

¹ International Energy Agency. *World Energy Outlook 2017*. Paris: OECD, 2017.

² Other states include Rwanda, Argentina, Cambodia, France, Zambia, Cuba, the Republic of Congo, Uzbekistan, Nigeria, Morocco, Laos, Paraguay, Uganda, Ethiopia, Tajikistan, Tunisia and Ghana.

handles the entire process and owns and operates the plant for the lifetime of the reactor (approximately 60 years). This model has concerned Western observers, who note that this creates a near perfect monopoly, and places Russian workers and valuable Russian assets and technology on foreign soil, perhaps creating a strategic interests for the Kremlin to maintain a physical troop presence in states with BOO model NPPs.

However, Rosatom also exports NPPs under the Engineering, Procurement and Construction Model (Turnkey), which is much less extensive both in participation and potential security and foreign policy implications. Under this model, which requires a so-called “intelligent consumer” as a qualified partner, Rosatom designs the NPP, delivers equipment and materials, constructs and installs the nuclear island and turbine, commissions the power plant and trains local personnel. The partner state provides additional design requirements and non-safety related equipment. Although financing varies between contracts, under this model Rosatom does not own the NPP and generally does not provide its own workers beyond the training phase.

Rosatom’s Test Cases: China & Turkey

China is Rosatom’s most important consumer, and is simultaneously the world’s largest consumer of nuclear reactors. In June 2018, Chinese and Russian nuclear executives signed the biggest package of contracts in the history of the two countries’ nuclear partnership. This package oversaw four deals including the construction of four reactors, cooperation on a fast reactor pilot project, and the supply of technology for China’s lunar exploration program. The historic contract, worth between \$3 and \$5 billion, is seen as part of Rosatom’s larger strategic efforts to expand its energy export business outside of the European market. Rosatom’s China deal also represents a burgeoning nuclear relationship with China that excludes Western participation.

As Russia and China continue to cooperate across a host of issues, Western policy makers have regarded nuclear cooperation as further evidence of growing strategic ties between the two states. However, unlike other contracts that will be discussed below, China (and Iran) pay for the construction of the NPP directly and do not benefit from state subsidized financing. China is in fact one of only two consumers that pays Rosatom outright, which makes it a crucial source of financing for the firm as it seeks to expand its reach into new, less profitable markets. Further, China is capable of fabricating water-water energetic reactor (VVER) fuel via technology transfer, and is entitled to do so for its Rosatom designed NPP at Tianwan. Rosatom therefore faces significant competition in the Chinese market, and must avoid politicizing its actions or seeking increased concessions on other issue areas.

In contrast, Russia’s BOO contract with Turkey, valued at over \$20 billion, has entirely different implications for the Russian firm and state. Whereas China pays for the construction of its NPP outright, Rosatom financed the majority of Akkuyu in return for a fixed price for 70% of the electricity produced for the first and second units, and 30% for the third and fourth units for 15 years. Given the huge capital costs of NPP construction, the extent to which Rosatom will actually profit from this project is debatable. In recent contract negotiations with Egypt under a BOO model, Russia agreed to an electricity price at roughly half of what they are charging Turkey. But the Turkish and Egyptian BOO projects reveal motivations for Rosatom beyond commercial viability. In addition to securing a

foothold in the downstream countries for the lifetime of the reactor, in Turkey Russia is working directly with the Turkish government to draft the nuclear regulations that will apply to its own projects. Several observers of the now on hold Jordan deal commented that Russia worked hard to secure the deal so that it would have a foothold in the region regardless of the outcome in Syria. Overall, under the BOO model, Russia has much greater strategic leverage over the downstream state than it does under its turnkey model contracts with both China and India.

While fears that Sino-Russian nuclear power cooperation are evidence of a strategic alliance remain as yet unsupported, the relationship is mutually beneficially. Unlike its myriad of other potential deals, China pays directly for its NPPs. The latest deal is valued between \$5-\$8b, which Rosatom needs to finance other less commercially viable nuclear investments. In return, China gets best-in class Russian technology to fuel the growing Chinese market. Although there has been increased cooperation in other economic and even military arenas, it is important to note that Sino-Russian nuclear cooperation (in the post-Soviet era) dates from 1992: predating any concerns about a so-called strategic alliance.

Implications

A cursory examination into Rosatom's export contacts reveal several interesting policy implications. First, in recent years, Russia has a relatively good safety record and historically was the architect (along with the United States) of the global nuclear safety guidelines. As Western participation in foreign nuclear projects declines, so does its influence on the international nuclear safety architecture. That said, Rosatom has demonstrated a commitment to upholding this architecture, and one implication of the BOO model is that trained Russian workers will be in charge of NPPs rather than workers in states with no previous nuclear experience. Further, as China increases its activities in the NPP export market, the US and Russia share a mutual interest in upholding non-proliferation, safety and security standards. As the two main founders of this legislation, the United States and Russia should work together to ensure that nuclear safety standards are upheld.

Secondly and perhaps more immediately pressing, while it is clear from the case comparison that the Sino-Russian nuclear cooperation is not evidence of a strategic alliance, Russia is indeed benefitting largely from the fact that US and Chinese interests are not converging, especially in Asia. This means that both Russia and China's interests (especially in energy) are complementary: Russia has resources that China needs, and China has capital that Russia needs. That said, its nuclear engagement in other states, including Turkey, Egypt, and even India, provide preliminary evidence for the notion that Russia is using its nuclear exports as strategic economic statecraft. Both China and Russia are engaged in large-scale economic statecraft around the world, and while China's efforts in this arena have received significant attention from academia, the policy community, and the popular media, Russia's efforts have largely been ignored outside of the European context. Russia's nuclear exports are evidence of expanded economic statecraft, particularly in the Indo-Pacific and Middle East. These efforts have been particularly successful, in part because the West has not offered a competitive and credible alternative. In the coming years observing the fine details of Russia's NPP exports (in particular its contractual arrangements) will be an important task.