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Small Modular Reactors: The Coming Wave of Nuclear Energy Competition

Nuclear energy is making a strong comeback. With rising energy demand and the push to reduce carbon emissions, it is becoming a crucial component of the global energy mix. In particular, Small Modular Reactors (SMRs) are emerging as a key technology within this landscape, offering flexibility, adaptability, and potential as a clean baseload power source. Generating less than 300 megawatts (MW)—compared to over one gigawatt (GW) for traditional reactors—SMRs are safer, quicker to build, and easier to deploy. In particular, the lower upfront costs make SMRs a highly attractive option for developing countries. While demand is strong, the technology remains in its early stages of development. Multiple countries are now competing to develop SMRs, with the first wave expected to occur in the early 2030s.[1] As the world eagerly awaits their large-scale deployment, the first to successfully roll out SMRs at scale will gain a significant first-mover advantage.

Russia and China are poised to gain a significant first-mover advantage in SMRs

In this intense competition for SMR development, the United States, long the undisputed leader in nuclear technology, is already falling behind Russia and China. As of August 2025, only Russia and China have started operating their

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SMR models, highlighting their dominance in this emerging field. Their dominance is not only in the reactors but also in supply of fuel for SMRs, called high-assay low-enriched uranium (HALEU). Currently, Russia has established a near-monopoly on the HALEU supply, with China being the only other country possessing the infrastructure to produce it at scale. Together, these two nations are poised to gain a substantial first-mover advantage, positioning themselves as primary suppliers in the global SMR market.

Russia and China's leadership in SMR technology has significant geopolitical implications. The export of SMRs offers significant geopolitical benefits for suppliers. They can establish decades-long supplier-recipient relationships encompassing fuel provision, training, and operational support. Additionally, Russia and China's monopolistic control over HALEU supply could enable economic coercion if they suspended fuel deliveries to exert influence. Given these countries' history of leveraging economic dependencies for strategic gains, their control over SMR technology and HALEU supply poses significant risks to global energy security and US interests. In addition, as first-comers to the SMR market, they can take advantage of the opportunity to establish rules and regulations related to SMRs, a role that the United States has played historically. In light of rather lax nuclear security and safety standards held by China and Russia, this could undermine the nonproliferation and nuclear safety standards that the United States has established and maintained since the beginning of the nuclear era and Atoms for Peace for the past seven decades.

These developments undermine US interests as well as global nuclear governance. This article aims to illustrate the current status of the development and deployment of SMRs and shed light on the potential dominance of the SMR market by Russia and China along with its geopolitical implications. Lastly, it provides policy recommendations for the Trump administration to strengthen the competitiveness of US SMR technology by enhancing quality and reducing costs. To that end, the article calls for government support—at least in the early stages—for SMR development, deployment, and fuel supply until the technology becomes commercially viable, as well as for streamlining the cumbersome approval and licensing processes delaying a rapid SMR deployment.

Nuclear Renaissance

Interest in nuclear energy is surging for two key reasons: it can serve as a viable alternative to fossil fuels that can help reduce carbon emissions and also meet rapidly increasing energy demands. As the planet faces unprecedented warming, countries have committed under the 2016 Paris Agreement to limiting the global average temperature rise to well below 2°C above pre-industrial levels.

Achieving this target requires cutting carbon emissions by 45 percent from 2010 levels by 2030 and reaching net zero—balancing greenhouse gas emissions with their removal from the atmosphere—by 2050. To date, over 130 countries have pledged or are considering a "net zero" target by 2050, but current national climate plans would reduce global greenhouse gas emissions by only 2.6 percent from 2019 levels by 2030—a fraction of what is required—underscoring the urgent imperative to cut emissions.[2] At the same time, the world is facing an exponential rise in electricity demand, with overall electricity consumption projected to surge by as much as 75 percent by 2050.[3] This is driven largely by the rapid expansion of artificial intelligence (AI). In particular, the growth of generative AI models like ChatGPT is accelerating energy consumption at an unprecedented rate. The International Energy Agency's 2025 report estimates that electricity demand from data centers that supply computing power for AI and other digital services around the world will more than double by 2030.[4]

Nuclear energy is emerging as a crucial part of the energy mix

Against this backdrop, nuclear energy is emerging as a crucial part of the energy mix, offering a solution to the dual challenges of rising electricity demand and carbon reduction. Nuclear power can generate vast amounts of electricity without emitting greenhouse gases. It also has exceptionally low CO_2-equivalent emissions—just 12 g per kWh, far lower than coal (820 g) and natural gas (490 g), and comparable to solar (41-48 g) and wind (11-12 g).[5] Nuclear energy can also replace fossil fuels for heating and facilitate large-scale hydrogen production, another key clean energy source, at increasingly competitive prices.[6]

While renewable sources like wind and solar are expanding rapidly—accounting for around 30 percent of global electricity supply in 2023 and expected to play a dominant role in the future[7]—they remain intermittent, dependent on wind and sunlight. This variability is not suitable for powering AI data centers which require a continuous power supply, and thus necessitate a reliable baseload energy source. Nuclear power could fill that role by operating almost continuously, producing electricity 92.3 percent of the time in 2024—compared to 23.4 percent for solar and 34.3 percent for wind in the same year.[8] In light of the above, the International Energy Agency (IEA) projects that nuclear power generation, a clean solution, must double by 2050 to achieve global net-zero emissions.[9] According to the International Atomic Energy Agency (IAEA), nuclear energy is already responsible for reducing global energy-related CO_2 emissions by 10 percent.[10]

Accordingly, an increasing number of countries are expanding or establishing nuclear energy programs. According to the IAEA, around thirty countries—

including Morocco, Kenya, the Philippines, Vietnam, and Norway—are considering incorporating nuclear power into their energy mix.[11] In July 2022, the European Union included nuclear power in its taxonomy of environmentally sustainable activities, making it eligible for financial support, which would accelerate nuclear energy expansion across Europe.[12] At the UN Climate Change Conference (COP28) in December 2023, twenty-two nations committed to tripling nuclear power generation by 2050.[13] Just three months later, in March 2024, the inaugural Nuclear Energy Summit—the world's first high-level meeting dedicated exclusively to nuclear energy—was held in Brussels, and leaders from more than thirty countries and the EU gathered to promote nuclear energy as a key tool in combating climate change.[14]

This trend is also gaining traction in the United States. The Biden administration pursued nuclear energy to meet its net-zero goal by 2050, unveiling an ambitious plan to triple today's nuclear generation of 100 GW and deploy 200 GW of new capacity by that year.[15] Major tech companies are also turning to nuclear power—Amazon has purchased a nuclear-powered data center, while Microsoft is sourcing power for its data centers from the Three Mile Island nuclear plant.[16] Support for nuclear energy is accelerating under the new Trump administration, not out of environmental concern but out of urgency to meet rising energy needs. Just five days after taking office, President Trump declared a national energy emergency and called for the "unleashing" of American energy, including nuclear.[17] The following month, Energy Secretary Chris Wright reaffirmed that expanding nuclear power is a key priority. On May 23, Trump issued four executive orders aimed at quadrupling nuclear energy by 2050—adding 300 GW of new capacity while streamlining regulations for licensing and testing reactors to expedite deployment, and strengthening the nuclear workforce, among other measures.[18] Nuclear energy is thus poised for a major resurgence in the United States.

Rising Demand for Small Modular Reactors

Particular attention has been paid to SMRs, which are rising as a "next big thing" in the nuclear market and offer numerous advantages. Being much smaller than traditional nuclear power plants, they are cheaper and quicker to build. Compared to traditional 1GW nuclear reactors, which typically take five to seven years to build,[19] GE-Hitachi's 300MW SMR is expected to take two to three years,[20] with smaller ones potentially taking even less time (although construction times for SMRs vary widely depending on their size and the provider). Additionally, the upfront costs of SMRs are significantly cheaper than 1GW reactors, which normally cost between $3 billion and $4 billion,[21] although costs vary widely—from China's Hualong One reactor at about $2.8 billion to France's Flamanville 3 at more than $15 billion.[22] For example, China's 125 MW Linglong One is projected to cost $700 million.[23] Russia's floating nuclear power plant housing two of its 35 MWe SMRs, KLT-40S, cost $480 million in total.[24] Although as it is now, SMRs may have a higher cost per unit of generation capacity compared to large nuclear power plants, this cost is expected to decrease significantly once mass production in factories begins and economies of scale take effect. They can also be more cost-effective in remote areas with small or off-grid systems, where large amounts of electricity are not required and large nuclear power plants are not feasible. Moreover, they have inherent safety features including automatic shutdown functions in the event of earthquakes or tsunamis, which can make them suitable for deployment closer to residential areas and reduce electricity transmission costs. The use of automated technologies in SMRs also requires less supervision, leading to lower operational costs, further driving down their overall cost.[25]

Additionally, SMRs' modular design allows for manufacturing of their components and systems primarily on assembly lines at a central facility, with the modules then transported to their sites fully assembled for installation. As the US Department of Energy describes it, they would be "ready to 'plug and play' upon arrival,"[26] eliminating the waiting time associated with on-site construction. Moreover, SMRs can be temporarily deployed in areas where energy demand is not constant, and then moved to other locations where additional power is needed.

Additionally, roughly three-quarters of the SMRs under development will operate on HALEU—uranium enriched from 5 percent to 20 percent U-235, a uranium isotope capable of sustaining a nuclear chain reaction, which is higher than the enrichment level of conventional nuclear fuel (up to 5 percent U-235). What this means is that SMRs can achieve greater efficiency, require less frequent refueling—only every three to seven years, or in some designs up to thirty years, compared to one to two years for traditional nuclear power plants[27]—and decrease the production of radiological waste.[28]

SMRs can achieve greater efficiency, require less frequent refueling, and reduce radiological waste

Unsurprisingly, given these benefits, many countries have shown interest in SMRs. Countries that already have nuclear in their energy mix, including the United States, France, and South Korea, are planning to add SMRs to their existing nuclear energy programs. Countries with no prior nuclear experience are increasingly interested in adopting SMRs due to their lower entry barriers, particularly their reduced costs and quicker deployment compared to traditional large-scale nuclear reactors. In 2022, Vietnam announced a plan to include SMRs in the country's energy mix after 2030, reversing its 2016 decision to defer the plan indefinitely due to lower demand projections. Vietnam's permanent representative at the IAEA, Nguyen Trung Kien, said that his country "shared common interests in the potential of new technologies such as small modular reactors, transportable nuclear power plant, and floating nuclear power plant."[29]

Vietnam is not alone. After suspending its construction of nuclear power plants in the 1980s, Thailand announced its goal to include 600 MW SMRs by 2037 in its 2024 national energy plan, as its natural gas resources are dwindling while its economy is fast growing.[30] On his 2022 campaign trail, Philippines president Ferdinand Marcos Jr. expressed support for adopting SMRs along with conventional nuclear reactors.[31] Additionally, Poland is seeking to deploy twenty-four SMRs by 2030,[32] and the Netherlands is exploring deployment of over thirteen SMRs by 2050.[33] While demand for traditional large reactors will persist, especially in major economies like China and India, SMRs are expected to see strong demand in European countries and emerging nuclear markets. According to some estimates, the global SMR fleet could reach up to 150 to 170GWe and even up to 350GWe by 2050[34]—equivalent to about 40-45 percent and up to 93 percent of the current global nuclear generating capacity from large reactors, which stands at around 376 GWe (as of August 2025).[35] This would be a considerable size given the much smaller generating capacity of individual SMRs.

Russia and China's Growing Dominance in SMR Supply

While the demand for SMRs is rapidly accelerating, their supply remains limited. According to the IAEA, eighteen countries are currently developing eighty-three different SMR concepts, but the vast majority of them are at an early stage,[36] with their first deployment not expected until around 2030.[37] Argentina is developing the CAREM-25, a 32 MWe pressurized water reactor. Originally slated for operation in 2017, the project has faced multiple delays, and the revised target of a 2028 launch remains uncertain.[38] South Korea is also working on several reactor designs, including 170 MW i-SMR, 330 MW SMART100, and the 60 MW marine-based Bandi-60, though none are expected to come online before 2030.[39] The United Kingdom is focusing on the fuel—it is pursuing HALEU supply by recently awarding URENCO, a multinational enrichment services provider, $245 million to build a facility capable of producing up to 10 tons of HALEU annually. However, this facility will not be completed until 2031.[40] The United States is falling behind, with SMR company NuScale's recent cancellation to deploy 77 MW VOYGR, making it unlikely that the first American SMR will be operational before the end of this decade.

It is Russia and China that are leading the development of SMRs and their fuel globally. As of August 2025, only two SMRs are operational, both of which are owned by either Russia or China, who are developing other designs nearing completion. Russia currently almost monopolizes the supply for HALEU, with China catching up. Russia is currently operating the world's first SMR, KLT-40S marine-based pressurized-water reactor model, developed by Russia's state-owned enterprise Rosatom, aboard its floating nuclear power plant (FNPP), Akademik Lomonosov. According to Rosatom, Akademik Lomonosov's two reactors generate 35 MW of electricity each, enough to power a city of 100,000 people. The plant supplies heat and electricity to the remote coastal town of Pevek in the Chukotka region of northeastern Russia. Since beginning operations in May 2020, it required its first refueling only in October 2023, highlighting its fuel efficiency. (As mentioned above, traditional nuclear reactors require refueling every year or two.) Russia is currently constructing four additional FNPPs.[41]

In addition, Russia has initiated plans to build its first land-based SMR in the Arctic region of Yakutia, known for its significant mineral reserves. This plant will feature one or two 55 MW water-cooled RITM-200N reactors, an adaptation of the design used in Russia's nuclear-powered icebreakers. Beyond providing electricity to the population in this remote Arctic area, the SMR is also intended to power mining operations, which are expected to consume over 90MW of its total electric capacity. The project received its construction license in April 2023, with commissioning expected in 2028. The reactor has a service life of sixty years and requires refueling every five.[42]

Russia is already planning to export its SMR plants abroad. In May 2024, Russia signed a contract with Uzbekistan to build an SMR plant consisting of six RITM-200N reactors, with a total capacity of 330MW, in the Jizzakh region. Rosatom's Director General, Alexei Likhachev, stated that "Rosatom has confirmed its undisputed global leadership in nuclear energy by signing the first-ever export contract for the construction of a small nuclear power plant."[43] The first unit is scheduled to become operational by 2029.[44]

When it comes to onshore SMRs, though, China is ahead of Russia. China's—and the world's—first onshore SMR began operation in December 2023 at the Shidao Bay nuclear power plant. This 210 MW High-Temperature Gas-Cooled Reactor-Pebble-bed Module (HTR-PM) was developed by state-run utility Huaneng, Tsinghua University, and the China National Nuclear Corporation (CNNC). Considered the world's first fourth-generation nuclear reactor, this homegrown technology showcases innovation with "more than 2,200 sets of first-of-a-kind equipment, including over 660 sets of innovative components," and features the world's first system that allows natural cooling without the need for emergency cooling systems, which alleviates safety concerns. The reactor operates on uranium enriched to 8.5 percent (HALEU), supplied by the CNNC, which claims to possess the world's largest fuel production capacity.[45] China has been promoting exports of this reactor abroad, making some progress through cooperation agreements with Saudi Arabia and Indonesia.[46]

In 2017, the CNNC began constructing another SMR, a 125 MWe pressurized-water reactor called ACP-100, also known as "Linglong One" (meaning "Nimble Dragon" in Chinese) at the Changjiang Nuclear Power Plant in Hainan Province. This design was the first SMR in the world to be approved by the IAEA. Linglong One is expected to be completed and operational by the end of 2025 or 2026, and is currently undergoing testing prior to full operation.[47] China's state media, the *Global Times*, reported anticipation for exporting the Linglong One, noting that several developing countries, including Thailand, Jordan, Morocco, and Türkiye, have already expressed interest in importing the reactor.[48]

China is also developing a marine-based SMR for use in FNPPs, the 50 MWe pressurized-water reactor type SMR, ACPR50S. Bohai Heavy Industry, a subsidiary of China Shipbuilding Industry Corporation, is reportedly leading the project with the goal of deploying twenty FNPPs. Once completed, these FNPPs are supposed to provide electricity, heating, and fresh water (through desalination) to the Nansha Islands—China's name for the disputed Spratly Islands in the South China Sea—which could strengthen its claims over them.[49] According to an IAEA report, as of November 2023, the basic design of the ACPR50S had been completed, with design optimization underway.[50] Chinese engineers have claimed that the ACPR50S has already been tested for safety and can withstand extreme climate events. As Liu Jing, Vice Chairman of China Atomic Energy Authority, put it, China is playing a "pioneering role in the development and deployment of small modular reactors."[51]

> **The advancements of Russia and China extend beyond SMR development to the supply of fuels**

The advancements of Russia and China extend beyond the development of SMRs to include the supply of their fuels. As of now, only TENEX, a subsidiary of Rosatom, has the capability to supply HALEU globally. China's CNNC also possesses the infrastructure for large-scale production, although its output is limited to domestic use and is not yet available on the global commercial market.[52]

America Lagging Behind

The United States is lagging far behind Russia and China in terms of the development and deployment of SMRs and the production of their fuel. Although it remains the world's largest nuclear energy producer and a leader in traditional large-scale reactor technology,[53] it is no longer at the forefront of next-generation nuclear innovation for the first time since the dawn of the nuclear era. This is not for lack of effort: the US government began supporting SMR development in the late 1990s and gave it a strong push under the Obama administration.[54] The urgency for this need was underscored in 2010, when then-Secretary of Energy Steven Chu warned: "Develop these technologies today or import them tomorrow," and urged the United States to accelerate R&D in advanced nuclear technologies with the goal of deploying one or two designs within ten years.[55] Fifteen years later, however, none have been deployed, and this is likely to remain the case until the end of this decade. NuScale initially planned to demonstrate a power plant composed of six 77 MW VOYGR, which has been certified by the Nuclear Regulatory Commission (NRC)—enough to power over 300,000 homes—at the Idaho National Laboratory in partnership with Utah utilities. However, due to low subscription after raising target power prices, NuScale terminated the project in November 2023, and is currently prioritizing its deployment plans in Romania and Poland, targeting the late 2020s or early 2030s. No finalized deployment deal has been secured in the United States.[56]

GE Hitachi, a US-Japanese joint venture, is developing a 300 MW boiling water reactor (BWR) built on GE Hitachi's proven BWR technology. The first BWRX-300 will be constructed in Ontario, Canada, following the province's approval in May 2025.[57] Poland has tentatively approved the future construction of twenty-four of these reactors across six locations.[58] Estonia has chosen this reactor design for the potential deployment of SMRs within the country.[59] However, none of these projects are located in the United States, and all are unlikely to be completed before the late 2020s or early 2030s.

Other US SMR technologies are still under development. TerraPower, another US firm founded by Bill Gates, is building an advanced nuclear reactor. In June 2024, it began constructing the United States' first next-generation nuclear facility, a 345-MW sodium-cooled reactor, under a 50/50 cost-sharing arrangement with the US Department of Energy.[60] Although not as small as typical SMRs (which are generally under 300 MW) nor modular, this reactor demonstrates safe and innovative technology, serving as a good example of public-private partnership in promoting advanced nuclear technologies. However, this reactor has not yet received a license from the NRC and will not be deployed until 2030. Additionally, advanced nuclear reactor and fuel company X-energy is developing 80 MW XE-100, a next-generation high-temperature gas-cooled reactor—the same type that China deployed in 2023—with backing from Amazon and an ambitious goal of deploying 5GW of SMRs by 2039. However, its first deployment is expected in the early 2030s, putting it roughly a decade behind China.[61]

The United States's HALEU supply is also lagging. It has been working to catch up, but progress has been slow. The United States' Centrus Energy has obtained a license to produce HALEU and is producing small quantities for demonstration purposes with financial support from the Department of Energy, but the output remains minimal; in November 2023, Centrus produced only about 20 kilograms of HALEU. It plans to ramp up production to 900 kilograms per year, or about one ton, but this is still only a small fraction of the more than 40 tons needed by 2030 to support the deployment of advanced nuclear reactors in the United States, according to the Department of Energy's estimates.[62]

In contrast, China and Russia have already deployed SMRs, are producing their fuel, and are rapidly advancing their expansion plans both domestically and internationally. Once they mass-produce SMRs, which is expected to occur around mid-2030,[63] they will achieve economies of scale, significantly driving down costs. According to a study, SMRs are expected to become cost-competitive with traditional large-scale reactors after deploying eighty to ninety units.[64] This scaling effect could provide China and Russia with a long-term cost and technological advantage, further widening the gap with the United States as they establish a first-mover advantage in the global SMR market.

So What?

Why does Russia's and China's dominance in the global SMR market matter for the United States? Because these two countries can leverage their leadership in the SMR market to enhance their geopolitical influence. By capitalizing on recipient countries' dependence on their supply of critical infrastructure—particularly given their dominance in the HALEU market—China and Russia can deepen dependencies, which they can weaponize for geopolitical purposes. Additionally, they could shape new rules and norms governing SMR use in ways that undermine global nuclear governance that promotes the peaceful and safe use of nuclear technology—an area where the United States has historically played a leading role in establishment and maintenance.

China and Russia are poised to leverage their SMR exports as a strategic tool. Nuclear exports have historically been used to establish long-term, deeply integrated relationships between suppliers and recipients, as they often come with comprehensive packages that extend beyond plant construction—which itself takes several years—to include fuel supply, engineer training, and operational consulting for plant safety and efficiency. While SMRs are designed for easier deployment and lower maintenance requirements compared to traditional reactors, recipients will still be dependent on vendors for fuel supply, operational training, maintenance, and technical support. In Russia's case, this dependence extends to spent fuel management, further tightening supplier-recipient ties. Given the long lifespan of SMRs—often up to sixty years—these relationships are expected to remain in place for decades, giving vendor countries significant diplomatic and strategic leverage.

Of particular concern is Russia and China's dominance in HALEU supply, which raises the risk of geopolitical coercion and economic weaponization, further entrenching their influence in the global nuclear market. If Russia continues to dominate the HALEU market, and China joins in, they could suspend fuel deliveries to nuclear facilities, causing severe energy disruptions in countries without viable alternative sources. This vulnerability could be exploited for geostrategic purposes. Both Russia and China have a history of using economic coercion to advance their geopolitical interests. In 2001, Russia cut off gas supplies to Georgia after Tbilisi demanded the closure of four Russian military bases, rejecting Moscow's request for a fifteen-year extension of their presence.[65] After invading Ukraine in 2022, Russia weaponized its gas exports by demanding payment in rubles to circumvent sanctions that cut it off from global financial systems, and by halting supplies to European countries such as Finland and Poland when they refused to comply.[66] China has also repeatedly employed economic coercion, from its export ban on rare-earth minerals to Japan over the Senkaku Islands dispute to import bans on Norwegian salmon in retaliation for awarding a Nobel Peace Prize to a Chinese dissident, as well as wide-ranging trade restrictions against South Korea for hosting a US missile defense system and against Australia for calling for an independent investigation into the origins of COVID-19.[67] Given this track record, the possibility that Russia and China could use nuclear fuel supply as leverage to advance their geopolitical goals—from undermining sanctions imposed for their violations of international norms to obstructing security cooperation with the United States and gaining access to critical infrastructure—cannot be dismissed.

Russia and China could use nuclear fuel supply as leverage to advance their geopolitical goals

Russia's and China's dominance in the SMR market would also significantly impact global nuclear governance. Since SMRs introduce new challenges and concerns, existing rules and norms will need to be adapted. Unlike traditional reactors, which are largely based on light-water reactor technology, many SMRs utilize non-light water reactor designs with unconventional features less familiar to regulators.[68] This will necessitate developing new industrial standards, licensing requirements, and nuclear security as well as safety regulations tailored specifically to SMRs. Moreover, to enable the global deployment of SMRs, these rules and regulations must be standardized and harmonized across different regulatory frameworks.[69] First movers in SMR development, deployment, and exports will naturally have greater influence over shaping rules and norms. This is not unprecedented—as a pioneer in nuclear technology, the United States played a central role in shaping the global nuclear order from the 1960s onward. Today, China is already taking the lead in standardizing and harmonizing SMR regulations. In September 2023, it hosted two IAEA workshops bringing together 142 participants from fifty-one IAEA member states to discuss key SMR-related issues.[70]

As Russia and China solidify their leadership in the global SMR market, they will be well-positioned to shape emerging SMR norms and regulations in ways that serve their strategic and economic interests—sidelining nuclear safety, security, and nonproliferation. Unlike the United States, China and Russia do not require recipients of their nuclear assistance to refrain from producing nuclear fissile materials, which could lead to proliferation of nuclear weapons, or at least proliferation of enrichment or reprocessing technologies that enable "nuclear latency," the capability to build nuclear weapons in short order.[71] Their nuclear safety standards are also concerning. China has a troubling history of industrial safety failures—marked by hasty planning, widespread corruption, and lax construction, oversight, and regulation—contributing to one of the highest industrial fatality rates in the world.[72] Russia's exploitation of Ukraine's Zaporizhzhia nuclear power plant as a tool of coercion—threatening nuclear disaster—demonstrates its egregious disregard for nuclear safety and underscores the grave risks its actions pose to global nuclear norms. All of these factors raise concerns that their dominance in the SMR market could potentially weaken global nuclear governance, which the United States significantly shaped and upheld over the past seventy years.

Policy Considerations for Washington

Given these geopolitical implications, it is crucial for the United States to counter Russia's and China's dominance in the SMR market. To achieve this, Washington must prioritize the expedited deployment of SMRs domestically, which requires addressing several challenges that currently hinder the US nuclear industry. The most urgent step is to make US SMR technologies more competitive by not only advancing their development but also ensuring they are delivered quickly and affordably. The US nuclear industry has a well-documented history of failing to complete projects on time and within budget. The near-dormancy of the US nuclear industry over the past three decades—during which only two power plants were built—has weakened the nuclear supply chain and workforce, further complicating the process.[73] Reversing this trend is essential.

Take, for example, the recent construction of Units 3 and 4 of Plant Vogtle, which used Westinghouse's traditional 1GW AP1000 with modular design features, in the state of Georgia—the two latest nuclear reactors and the first ones built from scratch in three decades.[74] These went operational in 2023 and 2024 respectively, only after a seven-year delay and $17 billion cost overrun (driving Westinghouse into bankruptcy).[75] A Department of Energy report pointed out multiple factors that led to problems with the project's execution. Significant rework was necessary due to poor quality of the original work, with known test failure rates of components ranging between 40 percent and 80 percent. Reactor designs were incomplete and unrealistic, supply of modules was late and incomplete, and their delivery showed poor performance. The nuclear labor force struggled with low productivity and high rate of absenteeism and attrition (though this was partially attributable to COVID-19).[76] The performance seen at the Vogtle power plant is not a viable model for competing with global rivals and raises concerns for future prospects for the United States' SMR industry.

To strengthen the US SMR industry both domestically and globally, government subsidies are essential. The high upfront costs of SMR development and initial deployment—though lower than those of traditional reactors—make investment risky for private entities, discouraging new reactor orders. However, these costs cannot decrease without broader deployment, creating a chicken-and-egg dilemma—private investors hesitate due to high costs, yet costs remain high without sufficient investment.[77] To break this cycle, government funding is crucial during the early stages when innovative technologies are not yet financially viable for private entities. Subsidies are necessary until SMR deployment reaches a self-sustaining scale, where both supply and demand grow organically, making SMR investments financially viable and profitable. China and Russia's state-owned enterprises benefit from strong government backing and substantial funding, whereas US firms lack consistent, long-term support to compete on equal footing. While federal funding has been allocated, it has been sporadic and inconsistent, slowing sustained progress.

To strengthen the US SMR industry, government subsidies are initially essential

Additionally, government support is critical for scaling up HALEU production. Although HALEU enrichment relies on existing centrifuge technology, it requires specialized infrastructure, regulatory frameworks, licensing regimes, and transport solutions—all of which drive up initial costs.[78] Without significant government investment, private companies cannot produce HALEU at the scale necessary for widespread SMR deployment.

Another key step that Washington should take is to streamline the approval and licensing process for new SMR projects. The NRC is known for its complex and time-consuming environmental approval and licensing process, which significantly increases costs and delays deployment. For example, Ariel Cohen, an energy expert at the Atlantic Council, argues that "building a new reactor is uniquely difficult in the United States due to its own self-imposed bureaucratic straight jacket," citing years-long waits for environmental impact statements (IES) and drawn-out NRC and public hearings which delay construction.[79] According to the Nuclear Energy Institute, the NRC's regulations often go "beyond that necessary to provide reasonable assurance of adequate protection of public health and safety" and are excessively burdensome, inefficient, and redundant. These challenges are particularly acute for innovative reactor designs that do not fit within the NRC's traditional framework, thereby stifling innovation and delaying deployment.[80]

The importance of this step cannot be overstated for rapid deployment of SMRs, as bureaucratic inertia remains a significant obstacle. SMRs must undergo the same lengthy and stringent approval process as large-scale reactors, despite posing significantly lower safety risks. This unnecessarily slows their deployment. The NRC needs to establish a separate licensing framework for SMRs to accelerate their approval and construction. The urgency of SMR deployment extends beyond the United States losing ground in the global market—it is also a matter of cost efficiency. The Department of Energy warns that a five-year delay in scaling the SMR industrial base could increase capital requirements by up to 50 percent to meet the goal of providing 200 GW of nuclear capacity by 2050.[81]

Thankfully, some progress has already been made—last year, Congress passed a bill to expedite this process, which then-president Biden signed into law. The Trump administration's efforts to cut through excessive and unnecessary bureaucratic red tape and speed up licensing and testing laid out in the May 2025 executive orders mentioned above could be particularly helpful in accelerating SMR deployment. These measures should be fully implemented and expanded to eliminate unnecessary and inefficient regulations that stifle innovation and delay deployment.

Lastly, Washington should also invest in necessary infrastructure other than reactors themselves. The government should restore the nuclear supply chain, from fuel supply to plant construction to spent-fuel management, either by strengthening domestic production or collaborating with foreign partners. Additionally, fostering a skilled nuclear workforce is essential to ensuring faster construction and higher-quality deployment. And for nuclear-generated electricity to be accessible for public consumption, SMRs must be integrated into the energy system, requiring adequate electric grid infrastructure including transmission lines. Given the significant positive externalities of large-scale, reliable, and clean nuclear energy production, these measures constitute a public good that the government should support.

China's and Russia's dominance in the global SMR market poses a threat to the United States' longstanding leadership in nuclear technology, its geopolitical interests, and global nuclear governance. With the United States lagging in the development and deployment of SMRs, and the gap expected to continue to grow, the United States must act and act fast. Securing leadership in the SMR market will advance President Trump's goals, as outlined in his January 2025 executive order, to "create jobs and economic prosperity for Americans forgotten in the present economy, improve the United States' trade balance, help our country compete with hostile foreign powers, strengthen relations with allies and partners, and support international peace and security."[82] Strengthening the American SMR industry is not just a business venture for private companies—it is a geostrategic priority for the United States, aligning closely with the new administration's objectives. The Trump administration can and should approach it with the urgency and commitment it demands.

Strengthening the American SMR industry is a geostrategic priority for the US

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