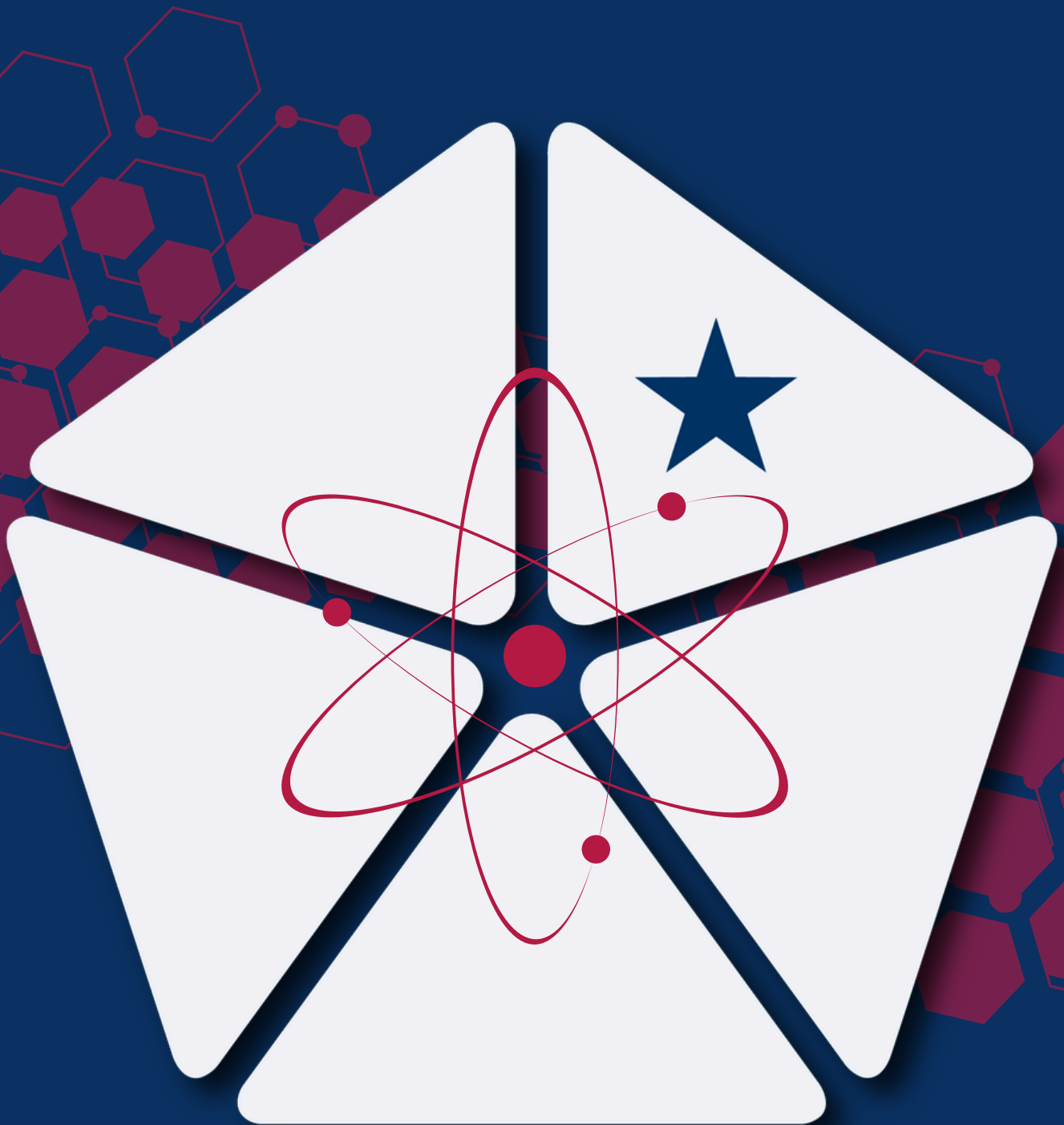


OCTOBER 2026



SPECIAL COMPETITIVE
STUDIES PROJECT



Sizing Up SMRs

Assessing U.S.-China Competition in
Small Modular Reactors

A Letter from SCSP's President

The United States is entering a decisive period for its energy future. Advances in artificial intelligence, growth in domestic manufacturing, and wider electrification are driving demand for reliable power. That demand is arriving faster than much of the infrastructure needed to serve it. Without a sustained effort to expand generation, strengthen the grid, and use energy more efficiently, power constraints will increasingly limit America's economic competitiveness and national security.

Nuclear power must be part of the response. It can provide reliable electricity and industrial heat without carbon emissions from generation. The United States pioneered the technology and remains a leader in nuclear research and reactor design. Yet it has struggled to build new plants at scale. Decades of limited construction have weakened the suppliers, skilled workforce, and project experience needed to deliver them. China, meanwhile, has sustained a substantial construction program and strengthened those capabilities through repeated builds.

Small modular reactors offer a consequential opportunity to change that trajectory. Their size could make individual projects easier to finance and allow capacity to be added as demand grows. They could serve industrial facilities, military installations, data centers, and communities that may be poorly served by a large plant. But the promise of factory production and lower costs will mean little unless developers can secure fuel, qualify suppliers, finance projects, and deliver successive units on schedule. **The race will be decided by who can build them quickly and on budget.**

This scorecard assesses where the United States and China stand across innovation leadership, industrial capacity, market ecosystem, talent pipeline, and national leverage. Its central finding is urgent: the United States has a diverse private sector, strong research institutions, and promising allied partnerships, but China currently has the stronger capacity to finance, manufacture, and build reactors repeatedly. America's advantages will not preserve themselves while demand rises and competitors gain experience.

Energy dominance requires more than promising designs or isolated demonstrations. It requires the capacity to build, deploy, and sustain nuclear power at scale alongside other sources of generation, grid investment, and greater energy efficiency. Government, industry, utilities, researchers, and workers must act with that shared objective in mind. The decisions made now will determine whether the United States can meet its growing power needs, strengthen its industrial base, and offer trusted nuclear partnerships to the world.



Ylli Bajraktari
President

Sizing Up SMRs:

Assessing U.S.-China Competition in Small Modular Reactors

Table of Contents

Executive Summary	3
Scope Note	4
Introduction	6
Background	10
Tech Scorecard	14
Innovation Leadership	16
Industrial Capacity	20
Market Ecosystem	27
Talent Pipeline	34
National Leverage	38
Outlook: Wildcards and What to Watch	44
Conclusion	45
Acknowledgements	46
Appendix 1: Glossary of Terms	47
Appendix 2: Tech Scorecard Data	49

Executive Summary

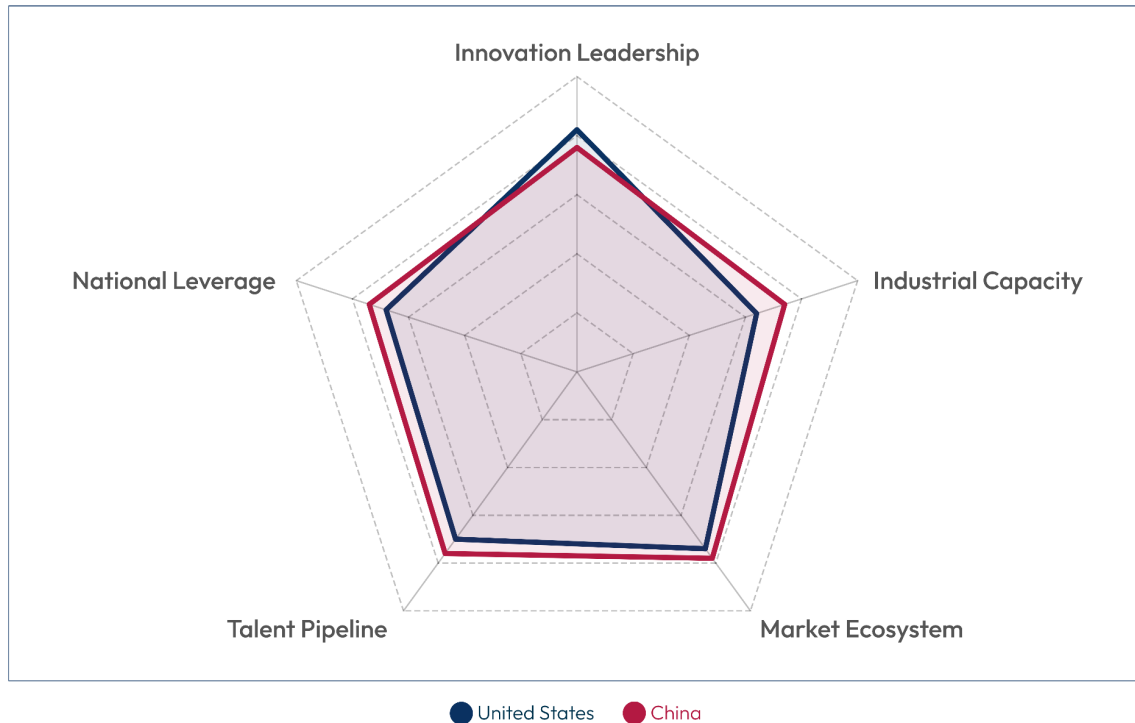
Power is becoming a constraint on America's industrial future. Artificial intelligence, data centers, advanced manufacturing, and electrification are driving demand upward while extreme weather places growing strain on the grid. The United States needs more reliable generation and stronger infrastructure. Small modular reactors (SMRs) could help meet that need, but only if their promise turns into electrons on the grid.

The United States and China are among the leading contenders to build SMRs and supply them abroad. America has a diverse private sector, strong national laboratories, and deep experience in reactor innovation. China has spent the past two decades building dozens of nuclear plants, while the United States has lost capacity. Each completed project strengthened the suppliers, workforce, and construction capabilities needed for the next. That experience gives China a substantial manufacturing advantage as both countries pursue smaller reactors.

China has already brought one SMR into commercial operation and is advancing another. The United States has many developers and designs, but no commercial SMR nearing completion. The gap is between the capacity to invent reactors and the capacity to build them. It will widen if American projects remain demonstrations while Chinese projects become repeat builds, powering their homes and businesses.

The SCSP Tech Scorecard finds that China leads in four of five dimensions: industrial capacity, market ecosystem, talent pipeline, and national leverage. The United States leads in innovation leadership. That advantage still matters, but designs alone will not deliver energy dominance. America must be able to finance, manufacture, build, and sustain SMRs at scale. The decisions made now will determine whether it can meet rising power demand and compete for the global nuclear market.

Tech Scorecard: Small Modular Reactors (SMRs)



Yet despite this early lead, China is not guaranteed to lead the world in SMRs in the coming decades. The United States continues to be more successful at exporting nuclear plant designs, and leads in the intellectual property behind these reactors. The critical challenge will be in turning American ideas into electrons. With the right policies, attention, and funding, the United States can still win.

Scope Note

Small modular reactors: fission reactors, designed for mass factory fabrication, which produce about a third or less of the power of a conventional reactor.

For this assessment, we include small modular reactors, microreactors, and small advanced reactors under the blanket term “SMRs.” This category includes advanced Generation IV designs cooled by gas, molten salt, or liquid metal, as well as smaller Generation III(+) light-water reactors using more established technologies and fuels.¹

¹ The Nuclear Regulatory Commission restricts its definition of SMRs to light water reactors under 300 MWe. In this paper, we use the Department of Energy’s power threshold and the broader industry definition, which includes non-light-water reactors. These differing definitions can cause some confusion. For example, the upcoming Chinese ACP100 light water reactor is often referred to as the first terrestrial

“Modular” refers to the factory production of major components for shipment and assembly at the site, enabling phased deployment.²

Table 1. Reactor definitions by size and type.
This paper includes all modular reactors under 350 MW as SMRs.

Term	Definition
Large Light Water Reactor (LLWR)	The conventional nuclear reactor design. LLWRs use water as a moderator and most often produce around a gigawatt of electricity , enough to power about a million homes.
Small Modular Reactor (SMR)	According to the Nuclear Regulatory Commission (NRC), SMRs are limited to light water reactors producing less than 300 megawatts of electricity.³ The Department of Energy (DOE) has a more flexible definition, considering SMRs as a light water reactor producing between 50 and 350 megawatts of electricity.⁴ The broader industry definition includes both light water and non-light water reactors.⁵ In this paper, we include both moderator types, and anything up to 350 MW as an SMR.
Microreactor	No official NRC definition, but tens of megawatts or smaller. ⁶ The DOE defines microreactors as having less than 50 megawatts of electricity.
Advanced Reactor	By the NRC definition, advanced reactors include light-water SMRs and non-light water reactors of any size. Non-light water reactors include high temperature gas-cooled reactors, molten salt reactors, or heavy water reactors.

SMR, but is preceded by the gas-cooled HTR-PM. [Advanced Reactors](#), Nuclear Regulatory Commission (last accessed 2026); [Pathways to Commercial Liftoff: Advanced Nuclear](#), U.S. Department of Energy (2024).

² [Small Modular Reactors](#), World Nuclear Association (last accessed 2026).

³ [Advanced Reactors](#), Nuclear Regulatory Commission (last accessed 2026).

⁴ [Gen III+ SMR Q&A](#), U.S. Department of Energy (2025).

⁵ [The Types of SMRs](#), NuScale Power (last accessed 2026).

⁶ [NRC Staff Presentation for the Workshop on Mobile Microreactor Licensing and Deployment Considerations](#), Nuclear Regulatory Commission (2025).

There are two commercially operating SMRs today: a floating light-water reactor in northern Russia and a pebble-bed gas-cooled reactor in China.⁷ Another Chinese light-water SMR is expected to achieve criticality and begin operations this year. The United States currently does not have any operating SMRs, but hosts a large ecosystem of SMR companies. This report treats SMRs and conventional nuclear energy as complementary: large reactors are still excellent tools for bulk power, and uprating them or extending their lifetimes is currently the easiest way to put nuclear energy on the grid. SMRs can address distributed, industrial, military, and export markets that gigawatt-scale plants may not serve as effectively, and have the potential to be more economical.

Introduction

The U.S.-China technology competition will be constrained as much by energy as by algorithms. AI, advanced manufacturing, and the domestic production of critical technologies require abundant, reliable power. Wind and solar will remain important, but their variability means the system also needs firm generation. Coal and natural gas generation produce carbon emissions and they rely on international fuel markets that can change costs and supply overnight.⁸ SMRs are an appealing alternative, with benefits for American international relations and domestic energy security. SMRs can provide either baseload (like conventional nuclear, providing 24/7 energy) or load-following power (changing power to match demand), making them well-suited to a modern energy grid. SMRs can also be multipurpose, utilized to generate steam and heat for manufacturing, desalination, and chemistry, in addition to electricity.⁹ This heat is often undervalued; almost half of global energy consumption in 2024 was through heat, relative to 22% of energy consumption as electricity.¹⁰ Access to a clean source of

⁷ There are a number of sub-350 MW reactors on the grid today, built over prior decades. Those are not counted here due to a lack of modularity.

⁸ While nuclear also runs on fuel, most of the cost of a nuclear plant is in its construction (capital expenditure) and not in its operation (operational expenditure), and refueling cycles are typically spaced out a year and a half apart. Most of the costs in natural gas or coal are operational expenditures, and they need a continuous supply of fuel. Sudden shocks to supply, as seen with Russia and Iran in recent years, can dramatically raise the price of these fuels on the global market.

⁹ [What Are Small Modular Reactors?](#), International Atomic Energy Agency (2021).

¹⁰ See [Share of electricity in total final energy consumption](#), Enerdata (2026); [Renewable heat](#), International Energy Agency (2025).

reliable power and heat will be a decisive economic advantage and a shield against international energy volatility.

Whichever nation can successfully mass export nuclear technology will attain geopolitical leverage and influence. For example, Russia has long proved the power of this model, using state-backed financing to secure multi-generational dependencies. Russia is currently under contract to export 22 reactors to seven nations, including in Turkey, India, Hungary, and China itself.¹¹ Russia considers nuclear exports to be part of statecraft, and covers the initial cost of construction of nuclear power plants overseas with 30-year state-backed loans.¹² In exchange, Russia gains 60-80 years of dependence for fuel procurement, engineering services, and waste management.¹³ While some projects, like one in Finland, were cancelled or interrupted following the full-scale invasion of Ukraine, these international nuclear partnerships have maintained Russian economic relationships that might otherwise have weakened or ended.¹⁴

SMRs can be an even greater opportunity for statecraft. Their smaller project size lowers the entry barrier for emerging and developing economies, while fleets of SMRs can create long-term relationships for fuel, training, engineering services, regulation, and waste management. Some designs that use TRISO fuel, a type of pellet that surrounds a uranium kernel with ceramic that should be leakproof, can also strengthen proliferation resistance, although risks vary by reactor and fuel cycle.¹⁵ Following Russia's full-scale invasion of Ukraine in 2022, construction of a Russian power plant in Finland was cancelled and two more, in Hungary and Türkiye, were delayed by sanctions and international political pressure.¹⁶ Rosatom's preliminary projects since then (in Uzbekistan, Kazakhstan, and Iran), have been limited to nations largely outside

¹¹ Filip Rudnik, [An uncertain future for Rosatom's nuclear technology exports](#), Centre for Eastern Studies (2026).

¹² See part 61 of [English Translation of 2015 Russian National Security Strategy](#), Russia Matters (2015).

¹³ After Russia's full-scale invasion of Ukraine, Westinghouse has begun manufacturing fuel for European VVER reactors. This alternative option would not have come into existence without a system shock like that sudden war. Sergey Aleksashenko, [The Nuclear Long Game: How Rosatom Became a Tool of Russian Influence](#), New Eurasian Strategies Centre (2026).

¹⁴ Jane Nakano, [The Geopolitics of Russia's Civil Nuclear Exports Four Years Into the War](#), CSIS (2026).

¹⁵ Some other reactors, like those using High-Assay Low-Enriched Uranium (HALEU) fuel without encasing in a ceramic fuel pellet, could have greater proliferation risks. HALEU is easier to enrich to weapons-grade than natural or low enriched uranium, but cannot be made into a weapon without further enrichment. Charles Forsberg & Andrew Kadak, [Reducing Proliferation Risks with High-Assay Low-Enriched Uranium Fuels in Reactors with Coated-Particle \(TRISO\) Fuels](#), Nuclear Technology (2025).

¹⁶ Filip Rudnik, [An uncertain future for Rosatom's nuclear technology exports](#), Centre for Eastern Studies (2026).

of the American sphere of influence, whereas pre-invasion projects included some EU and NATO members.¹⁷ Now both the United States and China stand to gain international nuclear customers and could anchor these nations into their respective technological, supply chain, and regulatory spheres.

Today, SMRs are viewed primarily as a safe tool for increasing the electricity supply. As outlined in the Trump Administration’s “Energy Dominance” agenda, energy security is critical to national security, and an affordable, safe source of domestic electricity is of utmost importance.¹⁸ SMRs are projected to have lower initial project costs due to their size, and could be more economically efficient than large reactors should factory economics develop as proprietors expect.¹⁹ SMRs also offer a scale suitable for non-utility customers, such as factories, military bases, and data centers that require tens to hundreds of megawatts of energy. If behind-the-meter electricity generation becomes more popular (or if it becomes legally mandated for data centers), SMRs will be a logical choice to provide that power.²⁰ By providing these strategic sites with independent, reliable power, SMRs could secure our industrial base against grid vulnerabilities and supply the uninterrupted energy needed to fuel continued technological innovation. Pending federal and state bills aim to restructure how data centers access power, such as allocating grid-upgrade costs to large-scale consumers or offering priority to facilities with independent, clean power sources. If enacted, these cost structures and incentives likely enhance the commercial appeal of SMR deployment.²¹

The social benefits of nuclear power have brought 38 countries, including the United States and many of its allies, to sign a Declaration to Triple Nuclear Energy.²² The

¹⁷ The Uzbekistan project includes Russia’s first contract to build SMRs outside of their own borders. [Uzbekistan and Russia mark SMR construction progress](#), World Nuclear News (2026).

¹⁸ [Executive Order 14154: Unleashing American Energy](#), The White House (2025).

¹⁹ As will be discussed later in this paper, SMRs could have a higher cost per kWh, despite the lower project cost. For organizations that need many gigawatts of energy (like utilities), cost per kWh might matter most. For organizations that need discrete amounts of energy (like factories or data centers), total project cost could be more important.

²⁰ Today, BTM is not the standard for electricity generation, but pushback over data centers and electricity rate raises are creating strong political pressure for data centers to bring their own power.

²¹ Pending Ratepayer Protection Act would establish a federal standard for states to adopt, requiring data centers and other large-load customers drawing 100 MW or more at a single site to cover the full, incremental cost of any grid upgrade needed to serve them. Similarly, the Power for the People Act would have FERC create prioritized interconnection queues for data centers, explicitly favoring those that offset their demand with self-funded, low-carbon power sources and clean backup generation. See H.R.9340, [Ratepayer Protection Act](#) (2026) and S. 3682, [Power for the People Act](#) (2026).

²² [Four more countries endorse global declaration to Triple Nuclear Energy](#), World Nuclear Association (2026); [At COP28, Countries Launch Declaration to Triple Nuclear Energy Capacity by 2050, Recognizing](#)

Trump administration has gone farther, aiming to quadruple national output to 400 GW.²³ SMRs will be key to adding that much nuclear power at scale.

The Safety of SMR Technology

Advanced SMR designs will be the safest nuclear power plants ever implemented. Advanced reactors with passive cooling systems will be sheltered from the need for continuous active circulation, making accidents with radiological consequences “practically impossible,” according to the International Atomic Energy Agency.²⁴

Similarly, with molten salt, liquid metal cooling, or TRISO fuel, reactors become incredibly resistant to meltdowns. It’s far easier for a moment of unexpectedly high power to boil away water in a conventional reactor than to evaporate metal, salt, or silicon carbide. A smaller reactor also means a smaller core, naturally limiting the potential impact of an accident regardless of fuel type.²⁵ These improved safety profiles allow SMR designs to have a much smaller or site-boundary Emergency Planning Zone (EPZ) compared to the ten-mile EPZ radius required around the site of a large nuclear reactor.²⁶ This can be another economic advantage for SMRs as it allows for easier colocation with businesses or residential areas.

These are improvements upon an already-safe technology. While safety is often the main concern for nuclear skeptics, no American citizen has been killed by radiation from a nuclear power plant.²⁷ In contrast, researchers claim that nearly 500,000 Americans died from coal plant air pollution from 1999 to 2020, although most deaths were before the mass installation of air-cleaning

[the Key Role of Nuclear Energy in Reaching Net Zero](#), U.S. Department of Energy (2023). This year, China also agreed to triple their nuclear capacity by 2050. See Jane Nakano & Yu-Hsuan Yeh [China's Nuclear Energy Priorities Under Its 15th Five-Year Plan](#), CSIS (2025).

²³ Josh Freed, et al., [Getting More for Your Money: The State of Play for US Nuclear in 2026](#), Third Way (2026).

²⁴ See Joanne Liou, [Safety by Design](#), International Atomic Energy Agency (2021). The Westinghouse AP1000, the Gen III+ large reactor most recently built in the United States, also has passive cooling, but operator intervention and onsite power will be required after 72 hours. See [AP1000 Plant Passive Safety Systems and Timeline for Station Blackout](#), Westinghouse (2021).

²⁵ [Understanding Emergency Planning Zones](#), NuScale (last accessed 2026).

²⁶ See [Understanding Emergency Planning Zones](#), NuScale (last accessed 2026); [Insights for Risk-Informed Approaches to Sizing Emergency Planning Zones](#), Nuclear Regulatory Commission (2022).

²⁷ [5 Facts to Know About Three Mile Island](#), U.S. Department of Energy (2022).

scrubbers.²⁸ Advanced designs can materially strengthen the safety case for nuclear power, but deployment will still depend on credible regulation, transparent risk communication, and community trust.

Background

BLUF: American companies are pivoting towards SMRs, as large nuclear reactors have been prohibitively expensive, and there is a growing demand from non-utility markets for SMRs. China has the resources and organization to build large reactors, but is also funding novel SMR concepts.

The American Approach: Innovation without Repetition

American companies are placing a significant bet on SMRs as a way to avoid the financial risk of large reactors. After building over a hundred large reactors (now down to 96 operating), the United States has faltered, with only two completely new reactors (Vogtle Units 3 and 4) built since the 1990s.²⁹ Those two reactors ran significantly over schedule and budget, costing seven years and \$16 billion more than initially planned, more than a doubling in cost. The Trump administration has attempted to reverse this trend through an \$80B partnership with Westinghouse Electric Company to build ten new large-scale AP1000 reactors with construction beginning in 2030, but funding details have yet to be released.³⁰ The deal includes a \$17.5B loan program through DOE to support the financing of this deal, but financing and constructing large reactors remains difficult and expensive in the United States. Even if these plants open on schedule, they will not provide power until the late 2030s at the earliest.³¹

²⁸ Marc Airhart, [Coal Power Killed Half a Million People in U.S. over Two Decades](#), The University of Texas at Austin College of Natural Sciences (2023).

²⁹ Watts Bar Unit 2 was placed into service in 2015, but had begun construction in 1972. Construction was halted from 1985 to 2007 as electricity demand increased less than expected. See [History of Watts Bar Unit 2 Reactivation](#), Nuclear Regulatory Commission (2021); Catherine Clifford, [America's First New Nuclear Reactor in Nearly Seven Years Begins Operations](#), CNBC (2023).

³⁰ Mark Shenk, [Westinghouse megadeal set to revitalize nuclear supply chain](#), Reuters (2026).

³¹ [Department of Energy Announces American Nuclear Supply Chain Loans](#), Department of Energy (2026); [Second Taipingling Unit Begins Supplying Power](#), World Nuclear News (2026). With the addition of Taipingling Unit 2, one of the 33 reactors under construction in the NYT piece moves to “completed.”

There are at least 22 American companies actively developing 27 different SMR designs, but only some of these are likely to pass the fiscal hurdles to reach the commercial market.³² This approach has diluted engineering talent and funding, but allows for greater competition to select a winning design. The United States shouldn't eliminate competition, but its market will need to downselect to the most credible vendors early enough to create repeat orders and manufacturing scale. Demand is also emerging outside the traditional utility sector. With the notable exception of the Tennessee Valley Authority's Clinch River project, leading commercial commitments have come from technology companies (including Amazon, Google, Meta, and Microsoft), combined with federal support.³³

Over the past year, the United States has accelerated its push toward small reactors. In May 2025, Executive Order 14301 directed the Department of Energy to help three advanced reactors achieve criticality by July 4, 2026. Through the Reactor Pilot Program, four reactors met this target by the morning of July 4. However, criticality—the point at which a nuclear reaction becomes self-sustaining—is only an initial milestone. It does not indicate a fully operational commercial reactor, as these units currently lack the infrastructure and power output needed to generate meaningful electricity.

The Chinese Approach: Build and Learn

China has pursued a different model: sustained financing, standardized construction, and repeated builds. Since the beginning of work at the most recent American reactors at Vogtle in 2013, China has built 14 large reactors from scratch, completed the 28 that were underway, and now has an additional 32 under construction as of July 2026.³⁴ This development boom rocketed China from generating less than 16 GW of nuclear power in 2013 to 61 GW today, just behind France for third-most in the world.³⁵ The 41 GW now

³² This figure was reached by taking the NEA's statistics for North America and subtracting the three included Canadian companies. [The NEA Small Modular Reactor Dashboard: Third Edition](#), Nuclear Energy Agency (2025). For a more detailed look at the status of each project, see the table in Josh Freed, et al., [Getting More for Your Money: The State of Play for US Nuclear in 2026](#), Third Way (2026).

³³ That notable exception is the Clinch River Site, a project to build GE Vernova Hitachi BWRX-300 SMRs with the Tennessee Valley Authority. See [Clinch River Nuclear Site Application](#), Nuclear Regulatory Commission (last accessed 2026).

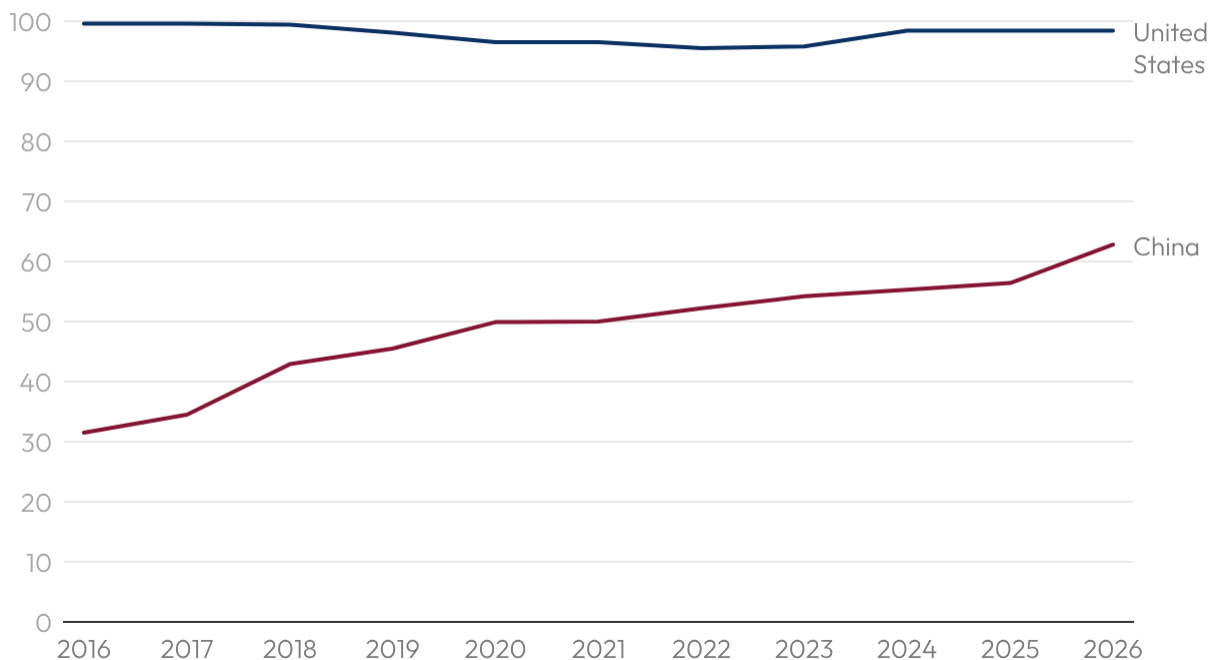
³⁴ See Brad Pulmer & Harry Stevens, [China is Outpacing the U.S. on Nuclear Power, an American Invention](#), The New York Times (2025); [Nuclear Power in China](#), World Nuclear Association (2026).

³⁵ [Nuclear Power in China](#), World Nuclear Association (2026).

under construction will allow them to displace the United States (97 GW) as the world's largest nuclear provider.³⁶

With that momentum comes speed. China can build their reactors quickly, in five to seven years.³⁷ Comparing first-of-a-kind timelines, China was able to build their first AP1000, at Sanmen, in nine years: that's faster than the fifteen years the United States needed to build Vogtle Units 3 and 4, but substantially slower than they have been able to achieve after more repetitions.³⁸ China's advantage is cumulative. Every completed project strengthens the workforce, suppliers, and project-management system for the next.

Nuclear Generation by Year [GW]



Source: U.S. Energy Information Administration, International Energy Statistics and Estimates, and the International Atomic Energy Agency (IAEA). American data for 2025 and 2026 is an estimate; there have been no significant updates, additions, or retirements since 2024.³⁹

³⁶ [Nuclear Power in the USA](#), World Nuclear Association (2026).

³⁷ Casey Crownhart, [Why China is betting on big nuclear reactors](#), MIT Technology Review (2026).

³⁸ Kamen Kraev, [First AP1000 Nuclear Plant At Sanmen Reaches Full Power](#), NucNet (2018).

³⁹ [China's nuclear power capacity nearly doubled since 2016](#), U.S. Energy Information Administration (2026); [Nuclear electricity installed capacity | United States \(1980–2024\)](#), Statbase (last accessed 2026).

Yet despite their successes in building large reactors, China has continued to invest in small nuclear reactors. They launched the first terrestrial SMR, the HTR-PM at Shidao Bay Nuclear Power Plant, which was connected to the grid in 2021 and commercially operational by 2023. A light water reactor design, the ACP100, is expected to have its first unit, Linglong One, start by the end of 2026, and is planned to be China National Nuclear Corporation's (CNNC) standardized SMR unit.⁴⁰ A thorium molten salt test reactor, which utilizes a non-uranium fuel cycle with less potent waste and more proliferation resistance, has been built, with a scaled-up 50 MWe version on the way.⁴¹ China already has experience selling small reactors overseas, having built a 325 MW (non-modular) reactor in Pakistan in the 1990s, well before their own nuclear renaissance began.⁴²

The Chinese government appears to still favor large reactors for light water technology. The gigawatt-scale Hualong One reactor design has seen significant financial support since before coming online, and now sees 41 units completed, under construction, or with government approval. In contrast, there has not been an announcement of a second ACP100 unit to follow Linglong One.⁴³ There is greater institutional support for Gen IV, non-water small reactors. Thorium reactors; however, are less mature but still have a clearly planned roadmap from the Chinese Academy of Sciences.⁴⁴ The first demonstration thorium reactor began operation three years ago. It is to be followed by a 10 MW demonstration reactor to be completed around 2030, a 100 MW commercial reactor in 2040, and then a rapid scaling to provide 10% of China's power by around 2050.⁴⁵

⁴⁰ Colleen Howe, [China to start commercial operation of first small modular nuclear reactor in 2026](#), Reuters (2025).

⁴¹ Thorium reactors create an opportunity to change the fuel cycle of a reactor. Instead of mining uranium, this relies on more plentiful thorium, and offers some proliferation resistance and less long-lived radioactive waste. Thorium is currently more expensive to extract than uranium and has unique handling difficulties. See [Thorium's Long-Term Potential in Nuclear Energy](#), International Atomic Energy Agency (2023); Siqin Hu, et al., [Novel dual-cooled assembly design and thermal hydraulic analysis for a 150MWt small modular molten salt reactor core](#), Nuclear Engineering and Design (2026). 50 MWe is assumed as the electric output of a stated 150 MWt reactor.

⁴² Sharad Joshi, [The China-Pakistan Nuclear Deal: A Realpolitik Fait Accompli](#), Nuclear Threat Initiative (2011).

⁴³ Jane Nakano & Yu-Hsuan Yeh, [China's Nuclear Energy Priorities Under Its 15th Five-Year Plan](#), CSIS (2026).

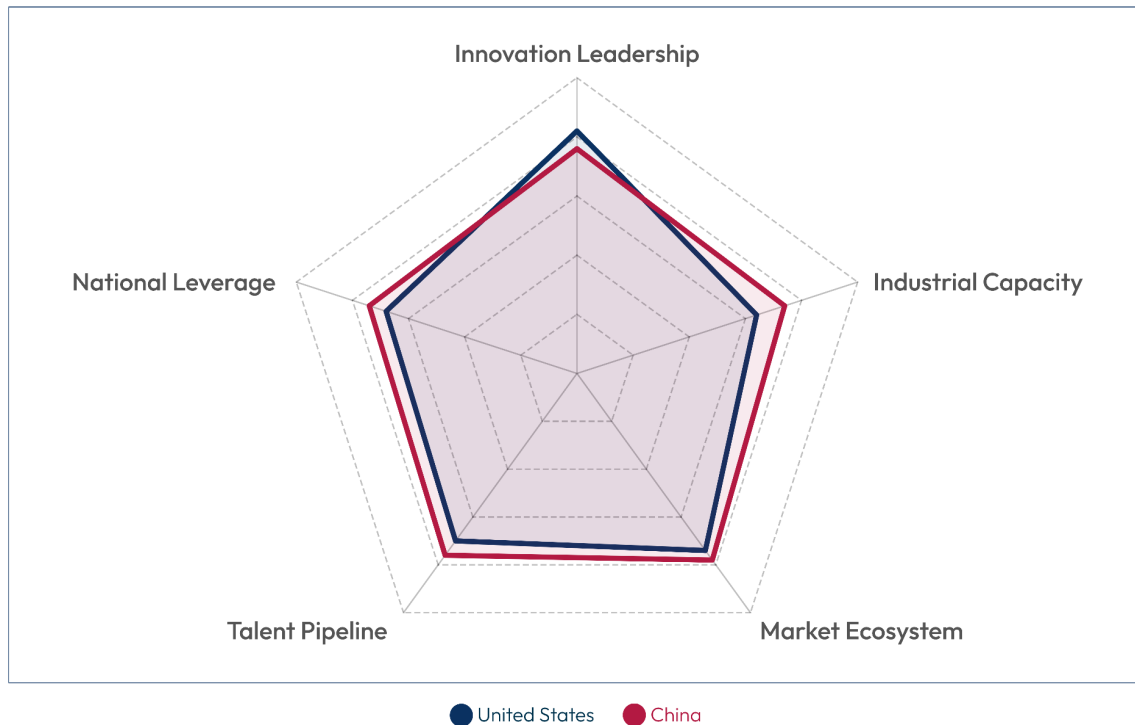
⁴⁴ [China's Nuclear Breakthrough Could Power It for 1,000 Years](#), The China Academy (2025).

⁴⁵ [中国拥有够用 2 万年“核能宝藏”！钍基熔盐堆如何改写全球能源规则？](#), China Science Communication (2025).

Tech Scorecard

China has a lead in most categories of the Scorecard. By nature of its diverse array of companies and greater set of patents, the United States leads in innovation leadership. In other categories, China's recent successes in scaling large nuclear and beginning to build first-of-a-kind SMRs grant them a lead.

Tech Scorecard: Small Modular Reactors (SMRs)



All sectors of this Scorecard are relatively well-developed, as the nuclear industry has been building reactors for decades. In no category is one nation truly dominant. There are differences in approaches, designs, funding, and international relationships, but it's still unclear to see which nation will lead the world in building small modular reactors.

What is the SCSP Tech Scorecard?

SCSP developed a comparative analysis framework to provide a comprehensive view of the state of the tech competition between the United States and China across a variety of key technologies. The scorecard compares quantitative and qualitative metrics across the five categories SCSP has determined are needed for technology leadership: Innovation Leadership, Industrial Capacity, Market Ecosystem, Talent Pipeline, and National Leverage.

The specific metrics considered are technology-specific and will vary between reports based on the technology readiness level and resource needs of each technology. Data are compiled from open source analysis, subscriptions, and expert surveys. For more information, see appendix 2.

Innovation Leadership

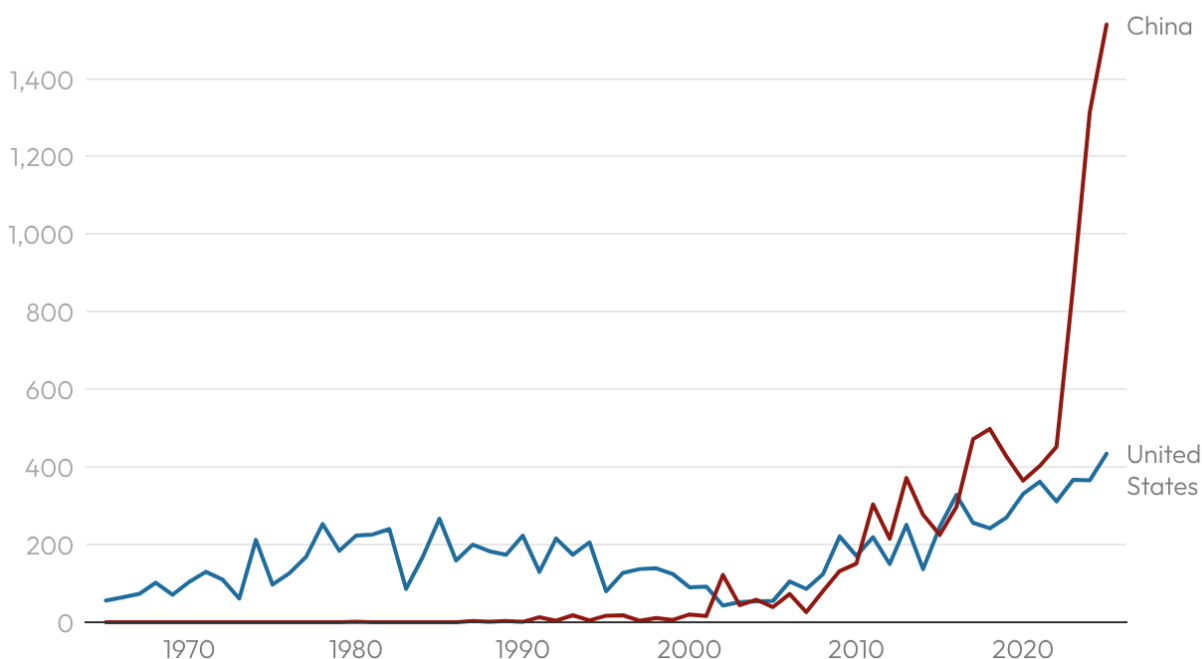
Leader: United States

Trending Towards: China

BLUF: China now leads in nuclear research volume and industry-academic collaboration; the United States retains a broad patent base and greater diversity of private reactor concepts.

China has rapidly expanded its expertise in the science of building nuclear reactors and now leads the world in publications. This effect has become particularly pronounced in the last five years. In 2025, more than three times as many Chinese-affiliated as American-affiliated authors were published in *Nuclear Engineering and Design*.⁴⁶

Author Affiliations in "Nuclear Engineering and Design"



Looking deeper into the *Nuclear Engineering and Design* dataset, the divide grows starker. Chinese authors excelled in tech transfer, writing ten times as many

⁴⁶ This is not uniformly true for every journal. *Nuclear Science and Engineering*, a journal of similar scope, still maintains a mostly American authorship base. *Nuclear Engineering and Design* was chosen as the journal to study, as it has almost twice as many publications available (19,000 vs 11,000) and twice the impact factor (2.5 vs 1.2) of *Nuclear Science and Engineering*. Databases are courtesy of [OpenAlex](#).

collaborations between industry and academia. Chinese authors also published far more domestic institutional collaborations, 182 to the United States's 48 in 2025. Chinese authors also were more impactful, having written over twice as many of the top 10% most cited papers of the last five years (218 to 95). This pattern is not an accident. These results align with the 15th Five-Year Plan's emphasis on international exchange, foreign-university cooperation, and incentives for overseas scholars to return.⁴⁷

One advantage that American journal authors hold is in international partnerships, where they had a slight lead (42 to 38). The United States does maintain a more open international research presence, but this statistic could also support the argument that America is lacking nuclear research infrastructure and must rely on international collaborations.⁴⁸ Overall, Chinese authors publish more articles than American authors do today, with greater impact.

It makes sense. A nation building reactors creates more operating data, engineering problems, and opportunities for learning. And China is building more reactors than the United States, with diverse concepts. One standout is the TMSR-LF1, a micro (2 MWth) experimental molten salt reactor that is the only currently operating reactor to run with thorium fuel.⁴⁹ Another reactor, the High-Temperature Reactor-Pebble-Bed Module (HTR-PM), is the world's first commercially operating modular high-temperature gas-cooled reactor, and the second commercial SMR.⁵⁰ The HTR-PM operates with TRISO fuel, small kernels of uranium encased in ceramic, which can allow for greater accident tolerance, proliferation resistance, and online refueling.⁵¹ These technologies are not Chinese in origin, but rather were first built in now-decommissioned test reactors at American national laboratory campuses.

⁴⁷ Zou Shuo, [China's 15th FYP to boost global education influence](#), China Daily (2026).

⁴⁸ One of the authors of this paper had to move to Slovenia to learn reactor operation and research during his graduate research at a flagship American university. While many American universities have research reactors, they are not as open or affordable for domestic collaborators.

⁴⁹ Thorium fuel opens opportunities for disposing of spent uranium fuel, and is three times as prevalent in Earth's crust. Thorium offers some proliferation resistance and creates a different fuel cycle. [Chinese molten salt reactor achieves conversion of thorium-uranium fuel](#), World Nuclear News (2025).

⁵⁰ The first, the Akademik Lomonosov, is a floating power plant in Russia, operated by Rosatom. It came online in 2019. [Russia connects floating plant to grid](#), World Nuclear News (2019).

⁵¹ [HTR-PM](#), Nuclear Scaling Initiative (last accessed 2026).



A TRISO fuel pellet, courtesy of the Department of Energy.⁵²

Patent data reveals an American lead, but China has more recent patents in fission overall.

Overall, the United States has a lead in granted patents categorized as nuclear fission technology, 39,000 to 29,000.⁵³ Not all of China's issued patents are Chinese intellectual property; some of these patents issued in China belong to Western companies, such as the 423 issued to Westinghouse. U.S.-issued patents are much more likely to be owned by American companies, as the United States has never built a foreign reactor design.⁵⁴ China's share of these general nuclear fission patents has dramatically increased, with over 21,000 appearing in the last five years. The United States, in contrast, produced an order of magnitude fewer patents. This dramatic shift came as China began building their own domestic reactor designs, like the Hualong One, instead of American or Russian designs.

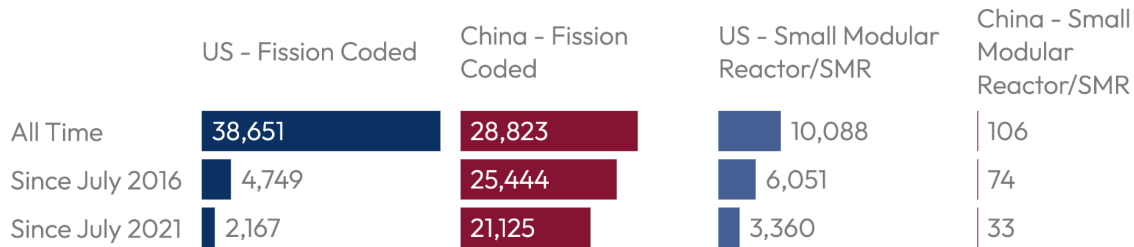
⁵² [TRISO Particles: The Most Robust Nuclear Fuel on Earth](#), U.S. Department of Energy (2019).

⁵³ This data is a summation of all granted patents under the three major patent classification systems: Cooperative Patent Classification (Code Y02E30/30), the International Center for Patent Registration (Code G21C), and the obsolete US Patent Classification System (Code 376).

⁵⁴ Westinghouse, founded and headquartered in Pennsylvania, had been the foremost American nuclear company, along with GE. Following a 2022 sale, it is now owned by two Canadian businesses, Brookfield and Cameco. For the purpose of this paper, it is still considered an American company. [Westinghouse changes hands again as Cameco buys into \\$7.9 billion deal](#), Nuclear Newswire (2022).

American and Chinese Granted Patents

■ US - Fission Coded ■ China - Fission Coded ■ US - Small Modular Reactor/SMR ■ China - Small Modular Reactor/SMR



Totals of American and Chinese granted patents. “Fission coded” patents include CPC Y02E30/30, ICPR G21C, and USPPC 376. Small modular reactor and SMR data is from keyword searches.

When narrowed down to a keyword search for SMRs/small modular reactors, there is a clear American patent lead, with over 10,000 patents to just 106 in China.⁵⁵ One explanation for this discrepancy is market structure. The competitive American ecosystem supports multiple companies pursuing similar concepts, each generating distinct intellectual property. With China’s controlled economy, only one innovative project of a certain type, be it molten salt or fuel pellets, will exist until scaling is ready. That reduces duplication and increases execution discipline, but it may also limit the number of independent technical approaches. The United States creates more options, but China is currently better at turning its options into hardware.

⁵⁵ More specific searches, like for “ACP100” or “TMSR”, produce very few or no results.

Industrial Capacity

Leader: **China**

Trending Towards: **United States**

BLUF: China holds a substantial industrial advantage across heavy manufacturing, qualified nuclear suppliers, uranium access, enrichment, and construction labor. Both nations have regulatory ecosystems that can be slow for novel designs, although both are adopting new regimes for advanced reactor designs. The United States retains important strengths in simulation, national laboratories, and private innovation.

China's advantage begins with the ability to build. The United States lacks domestic foundries capable of producing the largest pressure vessels for gigawatt-scale reactors, a constraint that has helped push developers toward smaller designs.⁵⁶ By contrast, China is capable of sustaining domestic pressure vessel manufacturing, having developed the world's largest seamless pressure vessel, at a scale and speed that its nuclear buildout requires.⁵⁷

Nuclear energy requires specialized subcontractors and supply chains. China's significant order book for nuclear reactors has built and sustained domestic suppliers. For example, the first Hualong One reactor was made with 88% domestic parts, and is expected to grow to 95% with future orders.⁵⁸ The United States, having built far fewer reactors this century, will need to rebuild its supply chain. This includes raw materials like graphite for moderation and manufactured materials like TRISO fuel pellets. The United States still must rely on trade and allies to make the necessary components for a new reactor. A reactor design without qualified suppliers, production tooling, and trained labor is intellectual property, not actual capability.

China has surpassed the United States in uranium production, enrichment capacity, and global access, although the United States has recently invested to rejuvenate its domestic uranium supply.

⁵⁶ There are foundries that can support SMR vessels. For example, TVA plans to partner with Scot Forge and North American Forgemasters to build a BWRX-300 at Clinch River. See Bridget Mintz Testa, [Heavy Duty](#), Mechanical Engineering Magazine (2012); [Two SMR projects selected for US federal funding](#), World Nuclear News (2025).

⁵⁷ [China steel mill makes world's largest seamless forging piece](#), Xinhua (2019).

⁵⁸ Lim Min Zhang, [China tours success of its first home-grown nuclear reactor](#), The Straits Times (2024).

China leads the United States in production of raw uranium, with domestic output tripling that of the United States (1,600 metric tonnes of uranium (tU) per year to 530).⁵⁹ This is despite China's uranium reserves being low-grade and relatively inaccessible.⁶⁰ That statistic even undervalues China's access to uranium, which increases by about an order of magnitude when considering Chinese ownership of overseas mines. In Namibia, for example, the Husab and Rössing mines (4437 tU and 2205 tU per year, respectively) are controlled by Chinese companies.⁶¹ These two mines account for over 90% of the output of one of the world's largest uranium producers. China's position is more reliant on international partnerships than domestic reserves.

China has not only invested in access to raw uranium, but also in enrichment. Between 2015 and 2023, China approximately doubled its enrichment capacity from ~6 million separative work units (SWU) to ~11 million SWU, approaching its current demand of 13 million SWU.⁶² China plans to reach 17 million SWU by 2030, which would provide enough enrichment capacity for their current and incoming reactor fleet. In the late 1990s and early 2000s, China expanded its enrichment capacity with Russian centrifuges. In the 2010s, China's enrichment additions were domestically built.⁶³

While China currently leads the United States in uranium production, its long-term concerns about uranium availability are enough to encourage a partial pivot away from uranium fission.⁶⁴ Following the success of their demonstration thorium reactor the Chinese Academy of Sciences expects thorium fission to support 10% of China's

⁵⁹ [Domestic Uranium Production Report – Annual](#), U.S. Energy Information Administration (2026); [World Uranium Mining Production](#), World Nuclear Association (2026). Data from the EIA is divided by 1179 to convert from kgU₃O₈ to tU.

⁶⁰ [China's Nuclear Fuel Cycle](#), World Nuclear Association (2024).

⁶¹ [Uranium in Namibia](#), World Nuclear Association (2026); [Swakop Uranium](#), Swakop (last accessed 2026).

⁶² Separative work units (SWU) measure the effort needed to enrich uranium for nuclear fuel, calculating the amount of work required to separate a natural uranium mixture into enriched uranium. This figure is based on a 2015 projection of 2020 capability. Another source places China's 2020 capabilities closer to 8 million SWU. More recent sources were not available. See [China's Nuclear Fuel Cycle](#), World Nuclear Association (2024); Hui Zhang, [On China's Nuclear Fuel Cycle](#), Presented for NASEM virtual meeting of the committee on Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors (2021); [China started operation of two new enrichment plants in 2023](#), IPFM Blog (2023); [Global Uranium Enrichment Market: Strategic Shifts & Capacity Decoupling \(2026\)](#), HDIN Research (2026).

⁶³ Hui Zhang, [On China's Nuclear Fuel Cycle](#), Presented for NASEM virtual meeting of the committee on Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors (2021).

⁶⁴ [China's thorium breakthrough could power ships for ten years on a single charge](#), ThinkChina (2026).

electricity by 2050.⁶⁵ This expectation is ambitious and will require a remarkable scale-up in the 2040s.

The American position is weaker, but improving. While China has been increasing its uranium production, U.S. production has fallen from its 1980 peak of 16,800 tU as a result of ending subsidies, increasing regulation, and price decreases.⁶⁶ Since then, the United States has been dependent on foreign imports or downblending weapons stocks for 95% of its reactor fuel supply. Today, only one facility enriches LEU at scale, making 4.3M SWU per year, with plans to upgrade to 5M by 2027. Another facility, American Centrifuge's High-Assay Low-Enriched Uranium (HALEU) lead cascade, has begun a small amount of production of the more highly enriched fuel most SMR designs will require, making 1 ton per year.⁶⁷

Foreign uranium imports to the United States are also facing an imminent crunch. In 2022, the United States declared a complete ban on Russian uranium imports by January 1, 2028.⁶⁸ This has created immediate pressure to increase domestic enrichment, as Russian imports were 25% of the uranium supply for American reactors. In 2025, the DOE established the Fuel Line Pilot Program within the Reactor Pilot Program to begin construction of new fuel supply infrastructure.⁶⁹ Earlier this year, the Department of Energy awarded \$2.7 billion to three companies to expand LEU enrichment capacity and create HALEU enrichment capacity.⁷⁰ This investment was desperately needed, and its focus on HALEU makes it more of a play for future SMRs than to imminently fix the Russian uranium gap. Other investments, like Urenco's upgrade to expand the National Enrichment Facility by 50%, have to fill that need.⁷¹ There are seven planned and proposed uranium enrichment plants and upgrades in the United States. Most of this planned new capacity will not be online until the 2030s, but the gap between losing access to Russian uranium and gaining new domestic supply is

⁶⁵ [中国拥有够用 2 万年“核能宝藏”！钍基熔盐堆如何改写全球能源规则？](#), China Science Communication (2025).

⁶⁶ [US Nuclear Fuel Cycle](#), World Nuclear Association (2026).

⁶⁷ [US Nuclear Fuel Cycle](#), World Nuclear Association (2026).

⁶⁸ [Backgrounder on Uranium Import Ban](#), Nuclear Regulatory Commission (2024).

⁶⁹ [Energy Department Fuel Line Pilot Program](#), U.S. Department of Energy (2026).

⁷⁰ Low enriched uranium (LEU, 3-5% enriched) has been the standard fuel for nuclear reactors in the United States, and high assay low enriched uranium (HALEU, <20%) is a planned fuel for a number of advanced reactor projects. [U.S. Department of Energy Awards \\$2.7 Billion to Restore American Uranium Enrichment](#), U.S. Department of Energy (2026).

⁷¹ [Urenco USA Plans Significant Expansion of U.S. Uranium Enrichment Capacity](#), Urenco (2026).

only a few power plant refueling cycles.⁷² Deals with other international suppliers should supply the necessary uranium as these new sources begin to come online.

The United States has a lead in nuclear simulation codes and benefits from the colocation of research and construction.

The United States retains an advantage in reactor modeling and simulation. As computational power increases and machine learning algorithms improve, simulations are an increasingly important piece of reactor design, operation, and licensing. Among Monte Carlo codes (the computationally intensive standard tool for high-fidelity reactor simulation), Los Alamos National Lab's Monte Carlo N-Particle (MCNP) code remains an industry-standard tool for design, simulation, and analysis.⁷³ Another leading Monte Carlo code, Serpent, is Finnish, but widespread throughout the American-allied nuclear sphere.⁷⁴ While access to these codes is restricted in the American and allied space, another premier Monte Carlo code, OpenMC, is open source and can be easily accessed and modified by Chinese researchers. Some other novel codes, like proprietary deterministic and hybrid models, increase the American advantage in this category, as they can allow for much quicker analysis of reactor performance and accident tolerance.

Another advantage of the American ecosystem is in the colocation of research and construction. SMR developers have close connections with national laboratories. Idaho National Lab hosts the Demonstration of Microreactor Experiments (DOME) testbed for experimental reactors, Kairos Power is building their demonstration facility at Oak Ridge National Laboratory, and eight of the ten Reactor Pilot Program test reactors are based at national laboratories, government energy research centers, or university campuses. China uses university-industry partnerships, including Tsinghua's role in HTR-PM, but generally places novel reactors on operating power campuses, as with Linglong One. The U.S. model favors experimentation; the Chinese model connects new designs to experienced builders and operating infrastructure.

Licensing reactors is generally easier in China, but can be slow for novel designs.

⁷² A typical refueling cycle in the United States is 18 months.

⁷³ [MCNP](#), Los Alamos National Laboratory (last accessed 2026).

⁷⁴ [Users](#), Serpent (last accessed 2026).

Licensing is one of the major bottlenecks to building nuclear reactors, and one most closely tied to government action. China's licensing architecture is shorter and more discretionary than the U.S. system, which has more established written processes.⁷⁵ The International Atomic Energy Agency's positive 2025 review of China's nuclear regulation found that China had "unique advances" in adopting modern AI and digital tools, but recommended improving their documentation for plant inspections, emergency response strategies, and safety culture oversight.⁷⁶ The compactness reflects a system calibrated for speed and consistency across a pipeline of similar designs. The Chinese regulatory system is also more recently written, while the American system has used regulations written fifty years ago.

Yet this lack of a well-established paper pathway within China can create difficulties for novel designs. The HTR-PM SMR, an innovative Chinese design, took eight years from preliminary work to permit approval.⁷⁷ For comparison, a more conventional large nuclear design, the CAP1400, was approved in seventeen months.⁷⁸ The front end of Chinese licensing can be slow and unpredictable for unconventional or new designs that are not approved by the State Council. What tempers this bottleneck is the Chinese government's commitment once a project has cleared the gates. As Chinese nuclear projects progress, they are added to the national infrastructure and resource strategy (the United States has no comparable planning), and a state-owned enterprise creates a subsidiary to build and operate the reactor. To date, China has never cancelled or denied a nuclear project following its inclusion by the State Council as part of the national strategy.⁷⁹

Advanced reactors in China also have a different application process than large reactors, and don't need to demonstrate safety in contexts only applicable to older reactor designs. Further changes are underway: China's National Nuclear Safety

⁷⁵ See Yue Jiang, [What Can the U.S. Learn from Chinese Nuclear Deployment?](#), The Breakthrough Institute (2025).

⁷⁶ [IAEA Mission Reviews China's Regulatory Framework for Nuclear Safety](#), International Atomic Energy Agency (2025).

⁷⁷ Jian Fu, et al., [Overview and Progress of High Temperature Reactor Pebble-bed Module Demonstration Project \(HTR-PM\)](#), Huaneng Shandong Shidao Bay Nuclear Power Co., Ltd. (2014).

⁷⁸ [Nuclear Power in China](#), World Nuclear Organization (2026).

⁷⁹ Yue Jiang, [What Can the U.S. Learn from Chinese Nuclear Deployment?](#), The Breakthrough Institute (2025).

Administration expects to introduce safety review guidelines for thorium molten salt reactors by 2028.⁸⁰

American licensing is historically slow and expensive, but new changes should significantly increase the speed of permitting.

In the United States, the Nuclear Regulatory Commission has historically had a slow and costly licensing system, with multiple decades of regulatory additions built atop each other. This is now changing. Earlier this year, the NRC unveiled its new regulatory framework for advanced reactors.⁸¹ In its 50-year history, the NRC has only certified designs for eight reactors, with 13 more in review or pre-review.⁸² Two of these, the NuScale US600 and US640, were SMRs. The initial cost of NRC certification for the US600 was almost \$1 billion, and, after economically required design changes, the upgraded US640 was approved two years later, in 2025.⁸³ Other SMRs, like TerraPower's Natrium and Kairos's Hermes and Hermes 2, have received construction permits but are awaiting full design approval.⁸⁴

With new legislation, the regulatory process for the next batch of reactors should be much less expensive. The NRC expects that this new framework for advanced reactors will halve application costs and get SMRs through approval in 18 months or less. Furthermore, in 2024, the ADVANCE Act codified a reduced hourly rate for NRC reviews for advanced reactors, decreasing the cost from \$337/hour to \$154/hour.⁸⁵ Another proposed new NRC rule, titled "Modernizing Reactor Licensing, Safety Oversight, and Siting Practices," could further cut costs by allowing construction of non-safety-critical portions of the reactor to begin as soon as an application is received.⁸⁶

The Department of Energy, rather than the NRC, is also taking a greater role in reactor licensing. In May 2025, the DOE established the Reactor Pilot Program to create a

⁸⁰ [中国拥有够用 2 万年“核能宝藏”！钍基熔盐堆如何改写全球能源规则？](#), China Science Communication (2025).

⁸¹ [NRC unveils Part 53 final rule](#), American Nuclear Society (2026).

⁸² [Backgrounder on New Nuclear Plant Designs](#), Nuclear Regulatory Commission (2025). This source cites seven approved, as the US640 was approved later.

⁸³ [NRC Approves NuScale Power's Upgraded Small Modular Reactor Design](#), U.S. Department of Energy (2025).

⁸⁴ [NRC approves TerraPower construction permit](#), Nuclear Newswire (2026).

⁸⁵ [NRC News: FY 2026 fees finalized, facility licensing reviews launched](#), Nuclear Newswire (2026).

⁸⁶ [A closer look at the NRC's reactor licensing revamp](#), Nuclear Newswire (2026).

pathway for DOE licensing of advanced reactor demonstration projects.⁸⁷ The NRC plans to adopt a streamlined fast-track pathway for designs proven through that program.⁸⁸ This pathway should improve regulation speed, but could limit the NRC's independence if the initial steps of regulation go to the Department of Energy, which is part of the executive branch.

Not all delays can or should be blamed on the NRC. Projects need approval from a state Public Utility Commission (PUC), and PUCs often don't begin their review process until the project has received its final approval from the NRC. This can add a year to the construction process and create major delays in hiring workforce.⁸⁹ This is not the case in China, where most nuclear plants broke ground within weeks of receiving their permits and required approvals.⁹⁰ For the United States to compete, reforms need to be wider than just the NRC.

⁸⁷ [U.S. Department of Energy Reactor Pilot Program](#), U.S. Department of Energy (2026).

⁸⁸ Francisco Camacho, [Nuclear regulator signs on to streamlined reactor testing](#), E&E News by Politico, (2025).

⁸⁹ Vogtle received its combined license from the NRC in February of 2012, but could not pour first concrete until March 2013. Kairos's Hermes demonstration unit gained its construction permit in December 2023, but actual construction was delayed until July 2024. See [Vogtle Electric Generating Plant, Unit 3](#), Nuclear Regulatory Commission (2022); David Dalton, [New Milestone In US As First Concrete Is Poured At Vogtle-3](#), NucNet (2013); [Hermes - Kairos Application](#), Nuclear Regulatory Commission (2023); [Kairos Power Begins Construction on Hermes Low-Power Demonstration Reactor](#), Kairos Power (2024).

⁹⁰ Yue Jiang, [What Can the U.S. Learn from Chinese Nuclear Deployment?](#), The Breakthrough Institute (2025).

Market Ecosystem

Leader: China

Trending Towards: Contested

BLUF: China leads in deployment economics, concentration of resources, and the ability to absorb first-of-a-kind risk. The United States leads in private demand, entrepreneurial breadth, and early allied-market commitments.

Private sector commercialization of SMRs will likely be key to advancing U.S. nuclear buildout, whereas state-owned nuclear enterprises in China have the capital to deploy SMRs and large-scale plants.

SMRs will have smaller size and may have shorter construction schedules, but they don't eliminate nuclear economics. Projects remain capital-intensive, exposed to delay and cost escalation, and may produce electricity at a higher cost per megawatt-hour than large reactors or other generation sources.⁹¹ These concerns make establishing a strong commercial market key to enabling a flywheel for further development, cost reduction, and long-term investment in this technology. In China, this economic challenge is being addressed with large amounts of state-directed funding to aggressively deploy small modular and large reactors.⁹² In the United States, where direct government spending is lower, other public incentives such as production and investment tax credits are supporting the development of SMRs, but the private sector also plays a critical role in driving demand for nuclear energy.⁹³ The American model can be successful, but the first projects must reach operation quickly enough to unlock follow-on orders.

China's SMR projects are fully government funded, whereas U.S. projects rely on a mix of private and public capital, with government funding often driving research and design and private funding helping to push forward deployment. The U.S. ecosystem includes established nuclear energy players (GE Vernova, Holtec, Westinghouse) and newer SMR-focused firms (TerraPower, X-Energy, NuScale, Oklo, Kairos, and NANO),

⁹¹ M. V. Ramana, [Small Modular and Advanced Nuclear Reactors: A Reality Check](#), IEEE Access (2021).

⁹² Robin Gaster, [Small Modular Reactors: A Realist Approach to the Future of Nuclear Power](#), ITIF (2025).

⁹³ [Inflation Reduction Act Keeps Momentum Building for Nuclear Power](#), U.S. Department of Energy (2022).

and there are currently three power-generating SMRs under construction (Project Pele, Kairos' Hermes 2, and TerraPower's Natrium).⁹⁴

The Chinese nuclear sector is organized by state-owned enterprises (SOEs), principally China National Nuclear Corporation (CNNC), China General Nuclear Power Corporation (CGN), and State Power Investment Corporation (SPIC), that execute the national nuclear policy goals of the government, treating nuclear buildout as a coordinated industrial program. CNNC is leading the three SMR projects currently under construction and built the country's first operational SMR in collaboration with China Huaneng Group (an electricity SOE) and Tsinghua University Institute, which serves as China's key SMR research hub.⁹⁵

Relative to the United States, China is developing fewer SMR designs (five designs by four organizations). With a state-directed economy, these designs are limited to a handful of established nuclear companies (China National Nuclear Company, China General Nuclear, State Power Investment Corporation), selling power to one domestic buyer (State Grid). This limited group of developers means less variety of options, but greater ability to concentrate resources to build them. The American portfolio offers more pathways to breakthrough, but also a greater risk of a divided market. The Chinese approach has fewer options and fewer developers, but concentrates talent behind those approaches.

Favorable deployment economics and quicker scaling potential are major strengths for China's SMR industry.

The economics of SMR deployment are in China's favor. China has the potential to capitalize on the benefits of modularity more quickly, has demonstrated learning in time-to-build, and has lower projected costs. While U.S. commercial SMR projects are

⁹⁴ We have elected to include Natrium in this paper, following the Department of Energy's classification of SMRs as ~50 to ~350 MW, though it is slightly above a more common 300 MW threshold. It is modular and much closer to the 300 MW threshold than to 1000MW, which is the typical output of a large-scale nuclear reactor. TerraPower's Natrium is a commercial reactor, whereas Project Pele is a mobile microreactor developed for military purposes.

See [Pathways to Commercial Liftoff: Advanced Nuclear](#), U.S. Department of Energy (2024); [TerraPower Commences Construction on America's First Utility-Scale Advanced Nuclear Power](#), TerraPower (2026); [Kairos breaks ground for Hermes 2 reactor](#), World Nuclear News (2026); [Project Pele](#), BWX (last accessed 2026); Mike Mueller, [INFOGRAPHIC: How Much Power Does A Nuclear Reactor Produce?](#), U.S. Department of Energy (2021).

⁹⁵ [NEA Small Modular Reactor Digital Dashboard](#), Nuclear Energy Agency (2025).

not expected to become operational until the early 2030s, China is actively scaling the technology.⁹⁶ A site currently under construction (but not officially announced) will host six units of its proven, operational HTR-PM design.⁹⁷ China also has a lower projected total cost for SMRs, including capital, construction, and operation.⁹⁸ Furthermore, should China's Linglong One reactor begin commercial operation by the end of 2026 as planned, it will have been completed in 5 years, reflecting a significant reduction in time-to-build from the 11-year Shidaowan HTR-PM project.⁹⁹ Critically, this learning is not limited to SMRs; China is also rapidly building large nuclear reactors, constructing them in groups to achieve economies of scale.¹⁰⁰ If China can deliver standardized large plants with SMR-like repetition, the addressable SMR market may narrow to missions where size, siting, flexibility, or industrial heat (rather than cost alone) is decisive.

China subsidizes its nuclear industry with low-interest loans. The United States has also issued loans for nuclear power plants, but to avoid risk, utilizes grants to support SMRs.

China's nuclear sector is organized around state-owned enterprises that can absorb project risk across large balance sheets and align financing with national objectives. Through state-backed financing, Chinese nuclear projects are generally funded 70–80% through loans, with interest rates as low as 1.4%.¹⁰¹ For instance, China National Nuclear Company's (CNNC) average debt cost falls around 3%–4%, with long-term loans generally using floating interest rates.¹⁰² This patient capital lowers the penalty for long construction periods and sustains a continuous pipeline of projects even when first-of-a-kind economics are unattractive.

The state-backed financing model also extends to China's nuclear exports. Export credit agencies (ECAs) can provide effective sovereign backing, reduce risk for

⁹⁶ See Sonal C. Patel, [TerraPower's Kemmerer 1 Enters Construction: Timeline of the Natrium Project's Road to First Power](#), Power Magazine (2026); [U.S. Department of Energy announces \\$400 million in funding to accelerate deployment of the nation's first commercial small modular nuclear reactor](#), GE Vernova (2025).

⁹⁷ [Xin'an HTR-PM 600-1](#), World Nuclear Association (last accessed 2026).

⁹⁸ [The Path to a New Era for Nuclear Energy](#), International Energy Agency (2025).

⁹⁹ See [Reactor Database](#), World Nuclear Association (last accessed 2026); David Dalton, [China's Linglong-1 Set To Become First Land-Based SMR To Begin Operation](#), NucNet (2025).

¹⁰⁰ Casey Crownhart, [Why China is betting on big nuclear reactors](#), MIT Technology Review (2026).

¹⁰¹ See [CGN: Funding for Nuclear Project Construction Typically Consists of 20–30% Equity Capital and 70–80% Bank Loans](#), Sina (2025); Yue Jiang, [What Can the U.S. Learn from Chinese Nuclear Deployment?](#), The Breakthrough Institute (2025).

¹⁰² [中国核电：本公司平均债务成本 3%–4%，长期借款普遍采用浮动利率计息](#), News QQ (2024).

commercial participants, and make technology offers difficult to match on price and tenor. For example, in 2015, CNNC loaned \$9-10 billion to Pakistan to build two ACP1000 reactors.¹⁰³

In the United States, the Export-Import Bank is a tool for nuclear export financing, as demonstrated by its recent support for building AP1000s in Poland.¹⁰⁴ However, the Bank could play an even larger role by expanding its direct lending and guarantee programs to support a broader pipeline of international nuclear deals.

The United States has also utilized loans to encourage its nuclear industry, but the Department of Energy’s major loan program now avoids novel reactor designs. The most significant energy loans program in the United States is the Office of Energy Dominance Financing (EDF), formerly known as the Loan Programs Office (LPO). Following a policy modification from the One Big Beautiful Bill Act, EDF has restricted its guidelines to projects that are already commercially proven and in operation. As of July 2026, EDF/LPO has spent \$30 billion on AP1000 projects, and nothing on any other reactor design.¹⁰⁵ Under this new guidance, the first SMRs cannot utilize one of the most effective financial tools available.

The United States government does support SMR developers through direct grants.¹⁰⁶ These grants are typically smaller than EDF loans, but still provide significant capital for startups navigating tech development and license approvals:

Table 2: Major American funding programs for SMRs

Program	Beneficiaries / Description	Amount
Advanced Reactor Demonstration Program (ARDP). ¹⁰⁷ This includes	Terrapower, X-Energy, Kairos	\$3.43 billion overall. This comes from a \$160M

¹⁰³ See [Financing Nuclear Energy](#), World Nuclear Association (2026); [Empowering Africa's Nuclear Energy Future: Innovative Financing Options](#), Nuclear Business Platform (2025).

¹⁰⁴ [EXIM Awards Energy Dominance Deal of the Year for U.S. Nuclear Export Project in Poland](#), Export-Import Bank of the United States (2026).

¹⁰⁵ Alan Ahn, et al., [On the Brink: Transatlantic Nuclear Exports at Risk](#), Third Way (2026).

¹⁰⁶ [Title 17 Energy Infrastructure Reinvestment \(EIR\) Financing](#), U.S. Department of Energy (last accessed 2026).

¹⁰⁷ See [Advanced Reactor Demonstration Program](#), U.S. Department of Energy (last accessed 2026); [Advanced Nuclear Energy Loan Guarantees](#), U.S. Department of Energy (last accessed 2026); Judi Greenwald & Erik Cothron, [The Case for Continued Investment in the Advanced Reactor Demonstration](#)

direct appropriations, matched funds, and milestone-based funding.		initial grant, \$2.47B to TerraPower and X-Energy in the Infrastructure Investment and Jobs Act, an additional \$500 million to TerraPower and X-Energy (matched one-for-one with private funds) and \$300 million through a milestone-based program with Kairos.
Specific cost-share program to reach its first licensing permit. ¹⁰⁸	NuScale	\$208 million
Generation III+ Small Modular Reactor Pathway to Deployment Program ¹⁰⁹	GE Vernova Hitachi, Holtec	\$800 million
Supply chain development, site selection, preparation under the Generation III+ SMR Pathway to Deployment Program ¹¹⁰	Constellation SMR Development, Nebraska Public Power District, BWXT, Container Technologies Industries, Framatome, Global Nuclear Fuel Americas, American Forgemasters, Scot Forge Company	\$94 million

Growing Private Demand and Early Export Agreements are Driving Growth for the U.S. SMR Industry.

Though the economics of deployment are in China's favor, in the United States, the data center boom is driving increased private demand, which may help to build the ecosystem capable of scaling and commercializing the technology long-term.

[Program](#), Nuclear Innovation Alliance (2025); [U.S. Department of Energy and Kairos Power Execute Novel Performance-Based, Fixed-Price Milestone Contract](#), Kairos Power (2024).

¹⁰⁸ [Grant to NuScale Power LLC](#), USASPENDING (2025).

¹⁰⁹ [Generation III+ Small Modular Reactor Program](#), U.S. Department of Energy (last accessed 2026).

¹¹⁰ [Energy Department Awards \\$94 Million to American Companies to Help Expedite the Deployments of Small Modular Reactors in the United States](#), U.S. Department of Energy (2026).

Proponents view data centers as a strong use case for SMRs, which offer scalable, 24/7, potentially colocated power and are a zero-carbon alternative to the gas turbines currently used by many new data centers. Recognizing this potential, firms such as Google, Meta, and Amazon have supported SMR development through various mechanisms, including direct investments and power purchase agreements – a promising signal for the development and eventual scaling of the technology.¹¹¹

The United States also has an early lead in capturing the global market. Though China is constructing a large nuclear reactor in Pakistan, international agreements specifically for SMR technology remain in the MOU phase, largely targeting the Global South.¹¹² In the United States, several firms have secured international commercial contracts: GE Vernova is building a site with four SMRs in Canada and has plans for construction at 6 sites in Poland, and NuScale signed a preliminary SMR contract with a Romanian energy company.¹¹³ These commercial agreements and the growing demand signal from large tech firms suggest continued growth for the U.S. SMR industry. For more on this, see the “National Leverage” section.

Behind the Numbers: On the Cost of Electricity

Levelized Cost of Electricity (LCOE), the most common metric for describing electricity costs and the one used above, is flawed.¹¹⁴ On its face, LCOE is simple: lifetime cost of an electricity producer divided by its lifetime energy output. However, LCOE does not account for the availability of electricity, total system costs, health and environmental costs, or locational costs.¹¹⁵ While intermittent electricity sources like solar can be remarkably cheap, they can only deliver power at certain times of day. That forces total system costs to be higher, as renewable-heavy systems will require building backups like battery storage or

¹¹¹ [TerraPower and Meta Enter Agreement for 8 Natrium® Advanced Nuclear Plants](#), TerraPower (2026). [Google and Kairos Power team up for SMR deployments](#), World Nuclear News (2024). [Amazon Invests in X-energy to Support Advanced Small Modular Nuclear Reactors and Expand Carbon-Free Power](#), X-Energy (2024).

¹¹² [Pakistan - World Nuclear Outlook Report](#), World Nuclear Association (last accessed 2026).

¹¹³ [Final Investment Decision taken for Romanian SMR project](#), World Nuclear News (2026). [Regions](#), GE Vernova Hitachi (last accessed 2026).

¹¹⁴ [Levelized Cost of Energy +](#), Lazard (2026).

¹¹⁵ Shafalli Khanna, et al., [Beyond the Levelised Cost of Electricity: why policymakers need better metrics for the energy transition](#), London School of Economics Global School of Sustainability (2025).

natural gas peaker plants.¹¹⁶ Fossil fuel-burning power plants also have significant uncounted social costs due to air pollution and carbon emissions. Power plants that can be located near energy consumers, like SMRs can, will lose less in the transmission process.

All nuclear reactors are undervalued by LCOE's shortcomings. SMRs in particular, which are more location-flexible and more likely to be load-following, have further uncounted advantages. In determining the cost for new electricity output, the relevant question is whether SMRs are competitive against the complete portfolio required to provide the same service, not whether they can beat the lowest standalone LCOE.

¹¹⁶ See Lars Schenikau, et al., [Full Cost of Electricity "FCOI" and Energy Returns "eROI"](#), Journal of Management and Sustainability (2022); Jan Emblemsvåg, [Rethinking the "Levelized Cost of Energy": A critical review and evaluation of the concept](#), Energy Research & Social Science (2025).

Talent Pipeline

Leader: **China**

Trending Towards: **China**

BLUF: While China has a significantly larger nuclear workforce, the United States maintains a slight edge in top-tier nuclear education and ability to attract international talent.

The United States has historically been a global leader in nuclear engineering and development, which has been driven by premier research institutions. Currently, there are approximately 23 undergraduate programs and 33 graduate programs and departments related to nuclear engineering in the United States.¹¹⁷ Federal programs - including the NRC Nuclear Education Program, the NSF Graduate Research Fellowship, DOE's Nuclear Energy University Program, and the University Nuclear Leadership Program - provide much of the supporting infrastructure.¹¹⁸ Recent instability around federal funding has led to declines in graduate student recruitment, and administrative delays and hurdles for DOE research grants have exacerbated this issue.¹¹⁹ Between 2010-2022 (excluding 2020), American universities produced an average of 160 PhDs in nuclear engineering per year, increasing 84% from 113 graduates in 2010 to 208 graduates in 2022.¹²⁰ At the same time, undergraduate degrees swelled to over 600 for most of the 2010s, then fell back to the mid-400s.¹²¹

¹¹⁷ [Nuclear Engineering Programs](#), Nuclear Engineering Department Heads Organization (last accessed 2026).

¹¹⁸ [ORISE report shows overall number of nuclear engineering degrees decreases to lowest level in more than a decade](#), Oak Ridge Institute for Science and Education (2024).

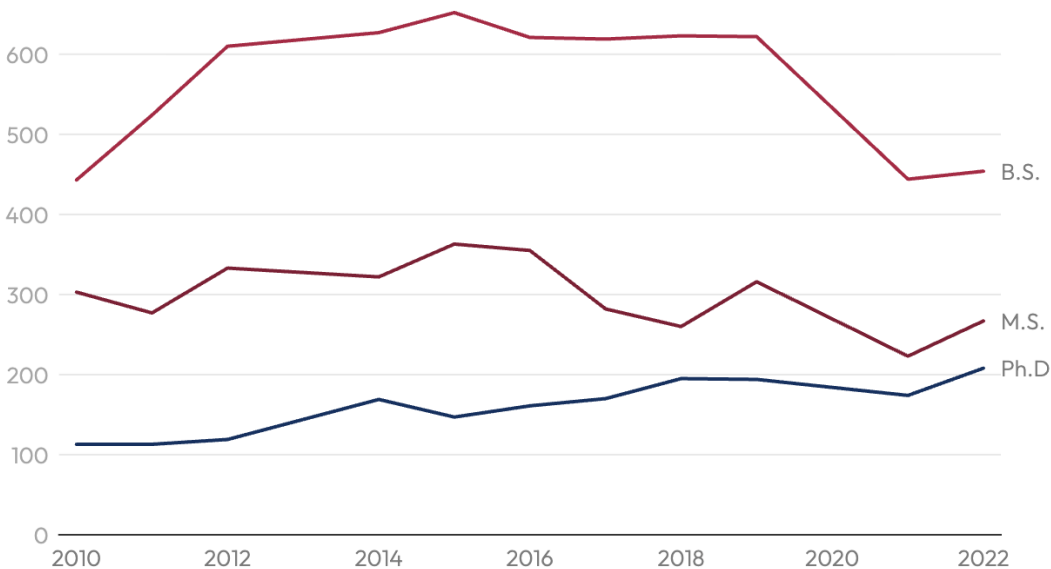
¹¹⁹ [Grant Opportunities](#), Nuclear Regulatory Commission (last accessed 2026).

¹²⁰ SCSP engagement with university nuclear engineering program director.

¹²¹ [ORISE report shows overall number of nuclear engineering degrees decreases to lowest level in more than a decade](#), Oak Ridge Institute for Science and Education (2024).

¹²¹ [ORISE report shows overall number of nuclear engineering degrees decreases to lowest level in more than a decade](#), Oak Ridge Institute for Science and Education (2024).

Number of American Nuclear Engineering Degrees Awarded



Source: ORISE

China's leading institutions now challenge the historical American lead. Tsinghua University, Xian Jaotong University, and Shanghai Jiao Tong University have become premier research institutions for nuclear engineering and physics.¹²² Tsinghua University, which helped develop HTR-PM, graduated 57 doctoral students and 37 master's students from its Nuclear Research Institute in 2025.¹²³ China is also actively attracting international nuclear talent through a scholarship program across 13 universities that began in 2023 to award funding to 100 students from developing countries who pursue study in China for nuclear energy and nuclear technology applications related to master's and doctoral degrees.¹²⁴ There are 34 undergraduate programs related to nuclear engineering in China, and we estimate that China produces approximately 140 nuclear engineering PhDs per year.¹²⁵

¹²² [Progress reports on SCWR-related development projects from Chinese universities for FY2008-2009](#), International Atomic Energy Agency (2010).

¹²³ [The Nuclear Institute held the 2025 graduate graduation ceremony](#), Tsinghua University (2025).

¹²⁴ [The Atomic Energy Scholarship Program of China](#) (2023).

¹²⁵ 2,000 postgraduate students in China, with an average of 30% of post-grads being PhDs, thus that means there are 600 PhD students. With an average PhD output time of 4.25 ($600/4.25 = 140$), there is an output of ~140 a year. More recent data is not available, but this estimate is plausible as most university nuclear PhD programs are quite small, with a few top universities such as Tsinghua producing dozens of PhDs. [Nuclear Education and Training at Tsinghua University to Meet the Need of the Rapidly Developing Industry](#), The Third International Conference on Nuclear Knowledge Management (2016); [Nuclear Engineering and Nuclear Technology](#), Baidu Baike (2025).

The United States still leads in attracting foreign talent.

As in many fields, the United States serves as a magnet for international talent. While some roles require security clearances and citizenship, most positions in the nuclear power sector are approachable to noncitizens.¹²⁶ National Labs are more restricted and generally require citizenship for federal employees.¹²⁷

For most roles, employment in the Chinese nuclear sector requires Chinese citizenship, and naturalization is difficult. Chinese nuclear research hubs have less competitive salaries, benefits, and living conditions than Western hubs, which make entry-level talent acquisition more difficult. China nevertheless operates targeted programs to recruit high-level foreign experts.¹²⁸ Earlier this year, Vice Premier Zhang Guoqing advocated for opening an international division of labor for nuclear projects in China.¹²⁹

In addition to citizenship requirements, American roles are more internationally attractive due to differences in pay. The average American nuclear construction worker makes about \$80,000 per year, whereas Chinese equivalents make ¥80,000, or about \$12,000.¹³⁰

China has a larger active nuclear workforce than the United States, and America lacks the manufacturing workforce for rapid deployment.

To translate nuclear research and development into deployment requires a skilled trade and manufacturing workforce, which the United States is struggling to maintain. Commercial deployment depends on welders, machinists, inspectors, operators, project managers, and qualified suppliers as much as on nuclear engineers. An aging workforce and insufficient pipeline of new talent is an issue across manufacturing, meaning the nuclear industry is competing against other sectors for this scarce pool of manufacturing labor. American nuclear employers, across all nuclear sectors, have reported difficulties in hiring, with most nuclear manufacturing employers describing

¹²⁶ [Nuclear Engineering Visa Sponsorship and the Clearance Question 2026](#), F1Jobs (2026).

¹²⁷ [FAQs for Job Seekers](#), Department of Energy (2024).

¹²⁸ Emily Weinstein, [Chinese Talent Program Tracker](#), CSET (last accessed 2026).

¹²⁹ [China ready to work with countries on inclusive nuclear governance, Vice Premier says](#), Reuters (2026).

¹³⁰ Yue Jiang, [What Can the U.S. Learn from Chinese Nuclear Deployment?](#), The Breakthrough Institute (2025).

hiring as “very difficult.”¹³¹ A shortage of nuclear-qualified machinists, welders, and inspectors remains a key bottleneck.¹³²

Compounding this shortage, traditional talent pipelines have also shrunk. The naval nuclear workforce has historically served as a talent pipeline for the private nuclear sector.¹³³ While the United States continues to have a larger naval nuclear workforce than China, the reduction of the U.S. fleet over the past decades has tightened this pipeline.¹³⁴ The United States Navy has 13,000 active duty nuclear operators that manage 11 aircraft carriers, 48 attack submarines, and 18 strategic submarines.¹³⁵ In China, on the other hand, the Chinese People’s Liberation Army Navy had an estimated 13–15 nuclear submarines as of 2024, but this number is projected to grow.¹³⁶

China's civilian deployment workforce is much larger. Overall, China accounts for 25% of the global nuclear workforce, whereas all of North America accounts for only 7%.¹³⁷ China’s nuclear workforce also has a higher share of workers in manufacturing than the global average, as nuclear employment in other regions is mostly focused on operation and maintenance of current infrastructure.¹³⁸ China developed expertise in the design and construction of their first domestically designed Gen III reactor, the Hualong One, with over 200,000 people participating in the construction of the first unit.¹³⁹ In contrast, time overruns for the Vogtle reactor in Georgia were partly due to a lack of skilled labor. After various failed attempts to recruit more American workers, the contractor leading the project attempted to hire hundreds of Canadian electricians and pipe fitters but faced hurdles in securing visas.¹⁴⁰

¹³¹ [3 Workforce Trends in Nuclear Energy in 2025](#), Department of Energy (2025).

¹³² [Landscape of U.S. Domestic Advanced Nuclear Energy Supply Chain](#), Solestiss (2026).

¹³³ Lawrence Townsend, et al., [Nuclear engineering workforce in the United States](#), Journal of Applied Clinical Medical Physics (2022).

¹³⁴ [Landscape of U.S. Domestic Advanced Nuclear Energy Supply Chain](#), Solestiss (2026).

¹³⁵ [The United States Naval Nuclear Propulsion Program](#), U.S. Department of Energy (2025).

¹³⁶ Monty Khanna, [Assessing the Submarine Training Capacity of the Chinese Navy](#), Observer Research Foundation (2024).

¹³⁷ [World Energy Employment](#), International Energy Agency (2025).

¹³⁸ [World Energy Employment](#), International Energy Agency (2025).

¹³⁹ [The Hualong One: China's solution for the global clean energy sector](#), China National Nuclear Corporation (2025).

¹⁴⁰ [Trump Administration Issues Shock Visa Denial to Canadian Members](#), International Brotherhood of Electrical Workers (2018).

National Leverage

Leader: China

Trending Towards: Contested

BLUF: Both the United States and China fund reactor projects through loans and direct grants, but China has the stronger financing and execution model. The United States leads in exporting SMRs and conventional nuclear technology. The Chinese licensing environment is typically easier for entities to navigate, but recent changes should make the American regulatory body more globally competitive.

China has coordinated industrial policy prioritizing nuclear energy expansion and direct control over the producers and providers of electricity. The United States is also prioritizing nuclear, in part through a strong ecosystem of national scientific laboratories.

The Chinese government has made the domestic expansion of nuclear power a priority and can execute effectively through direct control of its largest nuclear energy producers and consumers. Sustained, layered funding across successive Five-Year Plans (FYPs), has allowed for a rapid pace of development, each adding to a cumulative pool of investment that grows with every planning cycle and expands in its goals. This backing is reflected in the recent data: China operates 63 reactors, with 32 more under construction, and has further committed to installing 6 to 8 new reactors annually going forward.¹⁴¹ The most recent FYP (2026–2030), aims to add 48 GW of capacity over the next 5 years.¹⁴²

The United States’s public research ecosystem is historically far stronger. American national labs pioneered many of today’s novel reactor technologies decades ago, including pebble-bed gas-cooled reactors, thorium reactors, breeder reactors, and molten salt reactors.¹⁴³ It’s been estimated that American national laboratories have

¹⁴¹ See [China - Reactor Database](#), World Nuclear Database (2026); Brad Plumer & Harry Stevens, [China is Outpacing the U.S. on Nuclear Power, an American Invention](#), The New York Times (2025); Stephen Ezell, [How Innovative Is China in Nuclear Power?](#), Information Technology and Innovation Foundation (2024).

¹⁴² See Nuclear Business Platform, [China's Nuclear Power Program: A Blueprint for Global Competitiveness](#) (2025); Jane Nakano & Yu-Hsuan Yeh, [China's Nuclear Energy Priorities Under Its 15th Five-Year Plan](#), CSIS (2026).

¹⁴³ [History of Idaho National Laboratory: A Legacy](#), Idaho National Laboratory (last accessed 2026).

outspent the rest of the world by an order of magnitude.¹⁴⁴ As a result, most experimental data and experience on these advanced reactor designs is from the United States, albeit experienced by a prior generation than those building reactors today.

While the United States has a strong system of national laboratories, it does not have China's leverage of controlling a national energy grid or its major electricity producers, and public funding for nuclear energy is much lower. Including ARDP, with an annual budget of \$226 million, the DOE's annual nuclear energy budget was \$1.69 billion in 2026.¹⁴⁵ This pales in comparison to China's domestic nuclear program, which spent at least \$26 billion on nuclear energy in 2025.¹⁴⁶ In terms of publicly-driven deployment, the foremost public utility in the United States, the Tennessee Valley Authority, plans to build four SMRs in the 2030s.¹⁴⁷

The United States has a stronger network of allies and policy to promote the export of SMR technology.

There is currently a gap in nuclear exports, and a rising need for nuclear power in Europe. Following Russia's full-scale invasion of Ukraine, European nations are decreasing their dependencies on Russian natural gas, and nuclear is a primary solution to fill that gap. At the same time, Rosatom, owned by the Russian state, had been the most notable nuclear exporter. A faltering, sanctioned Russia creates opportunities for the United States or China to export gigawatts of nuclear power to consumer nations.

The United States leads the FIRST program, an international initiative with global allies to offer support for building capacity to countries exploring SMRs.¹⁴⁸ The United States is building off of an established legacy of nuclear export, including the modern Westinghouse AP1000 and older PWRs, BWRs, and research reactors like the General Atomics TRIGA. These strong international partnerships have already allowed for American firms to secure international SMR commercial contracts, such as GE Vernova Hitachi's collaboration with Ontario Power Generation to build the first four SMRs in

¹⁴⁴ Panel on The Outlook for Transatlantic Partnerships in Deploying US Nuclear Energy, Third Way (2026).

¹⁴⁵ [DOE FY 27 Budget In Brief](#), Office of the Chief Financial Officer (2026).

¹⁴⁶ [World Energy Investment 2026](#), International Energy Agency (2026).

¹⁴⁷ [NRC Dockets Construction Permit Application for TVA Small Modular Reactor](#), U.S. Department of Energy, (2025).

¹⁴⁸ [Civil Nuclear and Clean Energy Initiatives](#), U.S. Department of State (2025).

North America at the Darlington site in Canada, with construction underway. Poland is also planning on building a fleet of BWRX-300s.¹⁴⁹ Another SMR export is taking shape in Romania, where nuclear operator Nuclearelectrica has approved a Final Investment Decision to build six NuScale VOYGR-6 power plants.¹⁵⁰

Recent policy decisions have hampered America's ability to form trustworthy international partnerships. Escalating and fluctuating tariffs make America a less reliable trading partner. Our allies have begun looking elsewhere. Sweden recently elected to build Rolls-Royce SMRs from the UK over the more developed American BWRX-300 design.¹⁵¹

China has no SMR projects under construction overseas, but has several memoranda of understanding to do so. Indonesia is considering building Chinese (or Russian) SMRs, after ruling out Canadian and Korean reactor designs for being too large.¹⁵² Thailand and Malaysia have both signed nuclear memoranda of understanding with China, with SMRs specifically mentioned.¹⁵³

China has not had significant success in exporting large nuclear plants. The United States had in decades past, and now relies on exporting a single large reactor design.

Conventional nuclear exports are an imperfect but useful proxy for future export of SMRs. Interestingly, the only successful target for American reactor technology in the 21st century has been China. The AP1000 remains the principal modern U.S.-origin large-reactor design; fourteen reactors are under construction in Poland, Ukraine, and Bulgaria, with an additional five under contract, and four units entered service in China in 2018 and 2019.¹⁵⁴ In China, it's been supplanted by modified designs; the CAP1000 and CAP1400 are variations of the AP1000 for which Westinghouse receives a licensing fee.

¹⁴⁹ [Deployment of BWRX-300 small modular reactor in Poland takes major step forward with design development](#), GE Vernova (2026).

¹⁵⁰ [Final Investment Decision taken for Romanian SMR project](#), World Nuclear News (2026).

¹⁵¹ [Rolls-Royce SMR selected to deliver Sweden's first new nuclear power for over 40 years](#), Rolls-Royce (2026).

¹⁵² Edwin Shri Bimo, [Indonesia Goes Nuclear, Taps China and Russia for Modular Reactors](#), China Global South Project (2025).

¹⁵³ [PacNet #94 – Beyond fission: Where China is getting with small modular and fusion reactors](#), Pacific Forum (2025).

¹⁵⁴ [Study highlights economic impact of US fleet of AP1000s](#), World Nuclear News (2026).

Overall, sixteen operational and approved reactors in China are based on the AP1000 design.¹⁵⁵

China's skill in building large reactors domestically has largely not translated to exports. China's first fully indigenous Gen III design, the Hualong One, only first entered operation in 2021.¹⁵⁶ Their previous efforts, by being based on other designs, are difficult to build elsewhere. The CAP1000, for example, cannot legally be exported outside of China due to the licensing agreement with Westinghouse.

China's only current overseas nuclear project is the Chashma Unit 5 reactor, a Hualong One in Pakistan. Pakistan has been China's primary nuclear energy partner, hosting four CNP-300 reactors from the 1990s and two other Hualong One reactors that began commercial operation in 2021 and 2022.¹⁵⁷ China provided 82% of the funding for these Hualong One reactors through loans.¹⁵⁸ Kazakhstan has announced plans to build two Hualong One reactors, but construction has not yet begun.¹⁵⁹ This limited ecosystem is not due to a lack of effort. Attempts to build Chinese reactors overseas have stalled for political reasons.¹⁶⁰ In Argentina, a decade-long plan to build Hualong One reactors has ceased for financing concerns with China's central bank, leading Argentina to pivot towards SMRs and join the U.S. FIRST program.¹⁶¹

American projects are more likely to be derailed by local political opposition, but nuclear in general and SMRs in particular have increasing acceptance.

One major difficulty in building reactors on American soil has been local opposition. This could be a greater threat to SMRs, which, by virtue of their small size and small-to-nonexistent Emergency Planning Zones, could be located much closer to residential and

¹⁵⁵ [Westinghouse Welcomes Approval of Four New AP1000 Technology-based Reactors in China](#), Westinghouse Electric Company (2024).

¹⁵⁶ [China's first Hualong One reactor enters commercial operations](#), Reuters (2021). Despite only first operating five years ago, there are now a total of 41 Hualong One reactors in operation or under construction, all either in Pakistan or China. See [China's Hualong One nuclear reactor enters batch-scale expansion](#), CGTN (2026).

¹⁵⁷ [Pakistan begins construction of Chashma 5](#), Nuclear Engineering International (2025).

¹⁵⁸ [Why China came up short in nuclear Exports](#), Neutron Bytes (2026).

¹⁵⁹ Alexei Hoffman, [Kazakhstan Chose Russia and China for Its Reactors. Washington Wasn't Even in the Room.](#), Next Generation Nuclear Network (2026).

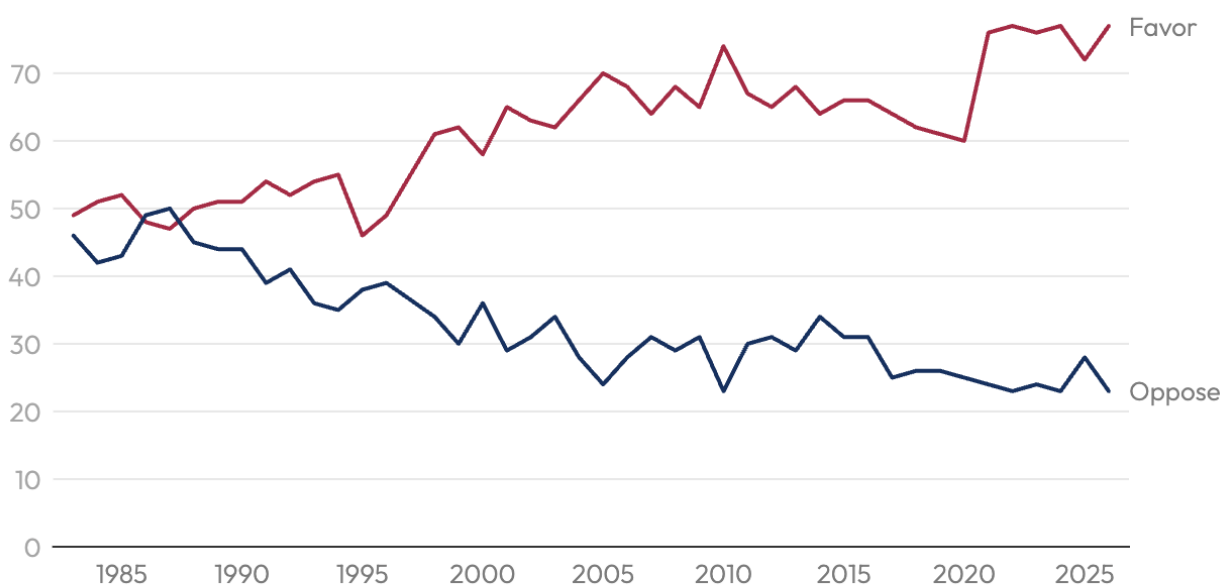
¹⁶⁰ [Nuclear Power in China](#), World Nuclear Association (2026).

¹⁶¹ [Nuclear Power in Argentina](#), World Nuclear Association (2026).

manufacturing centers than large reactors.¹⁶² The same proximity that creates economic value can intensify scrutiny over safety, land use, emergency planning, rates, and community benefit. Siting strategy must therefore begin before a project is announced, not after opposition forms.

While a slim majority of Americans (53%) would oppose a nuclear plant being built nearby, support for nuclear power is the highest it's been since Gallup began tracking its favorability.¹⁶³ SMRs tend to poll better than larger reactors, and support is strongest in communities that already host nuclear facilities: 86% of residents near a nuclear plant approved adding SMRs at the existing site.¹⁶⁴ While nuclear maintains significant net favorability, that doesn't guarantee community approval for a specific nuclear project being built nearby.

Nuclear Power's Favorability Among American Adults



Source: Bisconti Research

Chinese SMR builders have also run into local pushback. Two ACP100 units were planned to be built at Zhangzhou-Gulei, but those projects have been suspended after

¹⁶² Seth P. Tuler & Thomas Webster, [The challenge of community acceptance of small nuclear reactors](#), Energy Research and Social Science (2024).

¹⁶³ [Less Support in U.S. for Solar, Wind Energy; More for Nuclear](#), Gallup (2026).

¹⁶⁴ Ann Bisconti, [2026 National Nuclear Energy Public Opinion Survey: How to Strengthen Record-High Favorability to Nuclear Energy: Latest Survey Offers Tips](#), Bisconti Research (2026).

opposition from the local government.¹⁶⁵ Still, the autocratic Chinese system tends to see far fewer delays or canceled projects because of local opposition. China's engineering ethos favors building over environmental or social pushback.¹⁶⁶

¹⁶⁵ [Nuclear Power in China](#), World Nuclear Association (2026).

¹⁶⁶ Dan Wang, [Breakneck: China's Quest to Engineer the Future](#), W.W. Norton and Company (2025).

Outlook: Wildcards and What to Watch

Unlike most technologies mentioned in our Tech Scorecard series, fission reactors are a mature and commercialized technology, and have been for decades. SMRs, the same technology in a smaller package, require no scientific breakthroughs and build on proven underlying technology. The questions are less about whether they will work and more about whether they can be built on time and on budget. Their binding constraints are the same ones that have long dogged conventional nuclear: construction timelines, financial risks, licensing, and fuel supply.

What happens if the demand for AI data centers wanes?

SMRs will still have use cases and demand, and electricity demand will still be increasing, even without AI. Broader electrification trends in transportation, heating systems, and industry will outpace AI's electricity demand, albeit on slower timescales.

The relatively slow pace of building the first SMRs can serve as a shield against volatility in data center demand. A large-scale SMR buildout will likely begin only in the 2030s, and the initial projects being built today are not tied to any specific data center projects. Over the next half-decade, as experience clarifies the profitability and reliability of SMR projects, so will the AI market. If data center buildout continues into the 2030s, SMRs will be a logical choice for new electricity generation. If not, SMRs will still have a significant market for industry and utilities.

What happens if there's a significant nuclear accident?

It's highly unlikely, and hard to predict the outcome. New SMR plants, in particular, will have impressive passive safety systems, improving on nuclear power's already-stellar safety record. If another accident like Fukushima happened (no or very few direct deaths, but a major news story), some countries may abandon certain preliminary or exploratory nuclear projects, but it's unlikely that many existing or near-complete nuclear facilities would shut down permanently. Novel SMR technologies like gas-cooled or molten salt reactors should be walkaway safe. For these reactors, a new concern about traditional light-water reactor safety should not logically complicate their development, but public opinion would likely miss that nuance.

What projects will best predict the future of SMRs?

In addition to the two extant SMRs (the *Akademik Lomonosov* in Russia and the HTR-PM in China), there are a few preliminary projects whose success or failure will portend the future of SMRs. The Chinese reactor Linglong One, the first ACP100 unit, is expected to come online in 2026 and will determine the extent of China's interest in SMRs over the next decade. For the American side, some of the most notable projects to watch are at the Darlington site in Canada (built by GE Vernova Hitachi), the Clinch River site in Tennessee (Kairos), and the Kemmerer site in Wyoming (TerraPower).

Conclusion

China currently holds the positional advantage because it can finance, license, manufacture, build, and repeat. The United States retains formidable assets: a diverse private sector, leading intellectual property, national laboratories, technology-company demand, allied relationships, and recent regulatory momentum. Those advantages will matter only if they produce operating fleets. Treat large reactors and SMRs as complements, not substitutes: gigawatt-scale plants can provide bulk power, while SMRs can serve distributed industrial loads, military installations, data centers, remote sites, and export markets.

The near-term U.S. agenda is clear. Government and industry must converge on a limited number of designs, finance multiple units rather than isolated demonstrations, rebuild fuel and component supply chains, align federal and state reviews, and use allied markets to create scale. Recent changes in funding and regulation are a step in the right direction. Policy should preserve private-sector competition at the design stage while demanding standardization and execution at the deployment stage.

The decisive metric is not the number of announced designs, memoranda, patents, or criticality milestones. It is the number of standardized units that can be financed, licensed, manufactured, delivered on schedule, connected to customers, and supported over decades. The United States still has a credible path to SMR leadership, but the window to turn innovation into industrial power is narrowing.

Acknowledgements

SCSP thanks Caleb Barnes, Chiara Luepke, Sara Huta, Easton Cromer, and Nicholas Furst for leading the research and analysis of this Tech Scorecard. We are grateful to external reviewers including Sully Crevecoeur, Matt Parker, Rowen Price, and Patrick White, and internal reviewers David Lin, Martijn Rasser, Alec Sheres, and Nyah Stewart, each of whom strengthened the report with their input and expertise.

Appendix 1: Glossary of Terms

Fission: The breaking apart of heavy atoms, like uranium, to release energy.

Fissile material: Material that will fission when struck by a low-temperature neutron. The relevant fissile isotopes for nuclear power are ^{235}U , ^{233}U , ^{239}Pu , and ^{241}Pu .

Fertile material: Material that can accept a neutron and, while not fissioning themselves, convert into fissile isotopes. Fertile material can be used as reactor fuel. Examples include ^{232}Th , which breeds ^{233}U , and ^{238}U , which breeds ^{239}Pu .

Uranium-235: The naturally occurring fissile isotope of uranium. Less than one percent of natural uranium is ^{235}U , and all light-water reactors require a higher fraction of ^{235}U .

Low Enriched Uranium (LEU): Typically, LEU is enriched to 3-5% concentration of ^{235}U in its uranium. LEU is not usable in nuclear weapons, which require around 90% enrichment.

High Assay Low Enriched Uranium (HALEU): Uranium enriched to 5-20% concentration of ^{235}U . This is required for a number of advanced reactor designs. It's also not usable in a nuclear weapon, but is much easier to enrich further to weapons-grade.

Watt/Megawatt/Gigawatt: The unit of power used in this context. A megawatt (MW, one million watts), can continuously power about a thousand homes. A gigawatt (GW, one billion watts) is a thousand times greater power.

MWth / MWe: Megawatts-thermal and megawatts-electric. The thermal power of a system is derived from the heat of the reactor, whereas the electric power is what can be extracted as electricity. Electricity conversion in a nuclear plant's turbine has a 33% efficiency rate, so a 1 GWe power plant is producing 3 GWth.

NRC: Nuclear Regulatory Commission, the United States' chief nuclear regulator.

Light water: Everyday water, which is used as a coolant and moderator in conventional nuclear reactor designs. "Light" water is described in contrast to heavy water, which has hydrogen atoms with one more neutron than is typical (deuterium). Heavy water

reactors, like the CANDU, have a more effective moderator, can run on less enriched or natural uranium, and can be used to breed tritium for fusion machines.

HTGR: High-temperature, gas-cooled reactor. These reactors are cooled with a noble gas like helium and can run at much higher temperatures than water reactors without fear of meltdown. These reactors typically plan to use TRISO fuel pellets, which can be replaced without a shutdown.

SWU: A unit that defines the effort required in the uranium enrichment process for nuclear fuel, it calculates the amount of work required to separate a natural uranium mixture into enriched uranium.

TRISO fuel: Small kernels of uranium encased in ceramic. These offer proliferation resistance and accident tolerance, but do make it very difficult to reprocess spent fuel.

Appendix 2: Tech Scorecard Data

The Tech Competition Scorecard relied on expert scoring of quantitative and qualitative data across many technology-specific metrics relevant to each category of positional advantage in small modular reactor technology. Final scores were determined by a weighted average of the metric scores below.

The 1-to-5 ranking corresponds to the following rubric:

1. Negligible / Nascent: The country has minimal presence or capability in this metric. The data point is insignificant globally.

2. Emerging / Minor: The country is active but below the global average or industry standard. They are followers or niche players. Performance is functional but clearly inferior to top-tier competitors.

3. Competitive / Mainstream: The country operates at the global industry standard. The metric represents a healthy, functioning ecosystem that meets current market needs but does not differentiate itself as superior.

4. Advanced / Leading: The country is among the top tier globally. The metric shows performance, scale, or quality that exceeds the average and rivals the best.

5. State-of-the-Art / Dominant: The country sets the global benchmark. This metric represents the absolute peak of what is currently possible.

	Metric	Source(s)	Weight	U.S. Score	China Score
Innovation Leadership	Share of top publications	OpenAlex, Nuclear Engineering and Design	High	4	5
	Patent Count - Fission	Lens	High	5	4
	Patent Count - SMR	Lens	High	5	1
	Thorium Experiments / Reactors	National Interest	Medium	4	4
	HTGR / Experiments	Huaneng Shandong Shidao Bay Nuclear Power Co., Ltd.	Medium	4	4
	Tech transfer: share of articles that are co-authored by industry and academia	OpenAlex, Nuclear Engineering and Design	Low	2	5
	International collaborations: share of articles co-authored across countries	OpenAlex, Nuclear Engineering and Design	Low	4	3
	Domestic collaborations: share of articles co-authored across institutions	OpenAlex, Nuclear Engineering and Design	Low	2	5
	Share of top 10% most frequently used references published in the previous 5 years	OpenAlex, Nuclear Engineering and Design	Low	3	5
Industrial Capacity	Market share of relevant software	Los Alamos National Lab, OpenMC	Medium	5	3
	Vertical integration: co-locality of research, development, and manufacturing centers	Idaho National Lab, Oak Ridge National Lab	Medium	5	4
	Production of uranium: raw	Energy Information Administration, World Nuclear Association	Medium	2	3

	LEU enrichment capability	World Nuclear Association	Medium	2	3
	HALEU enrichment capability	U.S. Department of Energy, World Nuclear Association	Medium	2	5
	Number of nuclear-certified suppliers	World Nuclear Association	Low	3	4
	Ease of licensing	Breakthrough Institute	Medium	3	4
Market Ecosystem	Number of operating SMRs	World Nuclear Association	High	2	4
	Number of power-generating SMRs under construction	Third Way	High	5	5
	Number of modern, non-power-generating SMRs under construction or in operation	Third Way	Medium	5	4
	Number of majority-privately funded projects (in construction or siting/licensing)	China Daily	Low	5	1
	Projected LCOE in 2040	International Energy Agency	Medium	3	4
	International agreements (as proxy for future global market share)	World Nuclear Association	Medium	5	2
	Upfront Reactor Cost	International Cost Estimating and Analysis Association	Medium	2	5
Talent Pipeline	Masters' programs in nuclear engineering	Oak Ridge Institute for Science and Education, Atomic Energy Scholarship Program of China	Exclude	4	2
	Undergraduate degrees in nuclear engineering	Oak Ridge Institute for Science and Education, Baidu	High	3	4

	Relevant Ph.D./Eng.D. output, growth rate	Oak Ridge Institute for Science and Education	High	4	4
	% of global nuclear workforce	International Energy Association	High	3	5
	Imported talent	F1Jobs, Reuters	Medium	4	2
	Number of nuclear engineers in Navy?	U.S. Navy, Department of Defense	Low	4	2
National Leverage	Public funding (total) (all nuclear)	American Nuclear Society, Nuclear Business Platform	High	3	5
	Number of years technology has been prioritized in national strategies; thoroughness or coordination of tech strategy (and whether targets have been hit)	National Academies, Pacific Forum	Low	3	4
	Number of relevant national labs and state-backed reactor developers	TRX International, Information Technology & Innovation Foundation	Medium	2	4
	Number of reactor projects being built in other nations	World Nuclear Association	High	5	2