

Constructive

C1: Subs

America's SSBN fleet is aging out soon, new nuclear subs are needed.

Carlin 24 [Maya Carlin, 9-13-2024, The Navy's New Columbia-Class Missile Submarine Nightmare Is Here, National Interest, <https://nationalinterest.org/blog/buzz/navys-new-columbia-class-missile-submarine-nightmare-here-211581>, Willie T.]

Summary and 4 Points You Need to Know: The U.S. Navy's Columbia-class submarines, designed to replace the aging Ohio-class vessels and maintain America's sea-based nuclear deterrent, face significant delays and rising costs.

-Despite these challenges, the Columbia-class submarines, equipped with 16 missile tubes and advanced stealth technology, remain critical for maintaining U.S. nuclear deterrence in the face of growing adversarial threats.

\$1.7 Billion Over Budget: The Columbia-Class Submarine's Growing Price Tag

Considering the increasing hostility of America's nuclear-armed adversaries, maintaining a technologically superior nuclear triad should be a top priority for policymakers. The ability to strike from land, air, and sea gives the U.S. the capability to respond to any nuclear attack with a barrage of its own nukes.

The U.S. Navy's 14 Ohio-class submarines are currently responsible for America's sea-based nuclear deterrent. Upcoming Columbia-class ships are designed to replace these aging vessels, and they are scheduled to enter service in the early 2030s.

Earlier this year, the Navy revealed that delivery of the first Columbia-class submarine is now expected to be delayed between 12 and 16 months. According to Bloomberg News and other outlets, delays affect the vessels' bow section and power generators.

The Navy's top civilian asserted in April that one of the most significant drivers of the delays is the slower delivery of a turbine generator constructed by Northrop Grumman. This news was detailed in a 45-day review conducted by Navy Secretary Carlos Del Toro.

An Overview of the Columbia-Class

Ohio-class submarines are the largest ships of their kind. Columbia-class boats will be even bigger. These vessels will measure 560 feet in length and displace nearly 21,000 tons, making them the largest and most complex submarines in history. The ships' nuclear reactors will not require refueling during their planned lifetime service.

USS District of Columbia (SSBN-826) and USS Wisconsin (SSBN-827) are the only boats in this class ordered so far and will be followed by an additional 10 submarines.

Electric Boat and Newport News Shipbuilding are constructing the ships from start to finish, as they are the only manufacturers in the country with the capacity to build nuclear-powered subs.

Few details about the Columbia class are unclassified, but some information has been shared. Each submarine in this class will be fitted with 16 missile tubes for launching Trident II D5 submarine-launched ballistic missiles. From boat nine onward, the remaining submarines will be equipped with an upgraded D5LE2 ballistic missile. Columbia-class submarines will boast enhanced acoustic performance and Mk 48 torpedoes. They will be extremely challenging for adversaries to detect.

What Is Hurting the Columbia-Class's Prospects

While the Columbia class is built for the essential task to manage the Navy's deterrent, the hefty price tag keeps growing. The Navy projected this fall that the lead ship of the class will cost around \$1.7 billion more than projected. The Congressional Budget Office further warned that the rest of the ships will cost roughly \$1.5 billion more than intended. "CBO estimates that total shipbuilding costs would average about \$34 billion to \$36 billion (in 2023 dollars) over the next 30 years, which is about 16 percent more than the Navy estimates. Compared with its estimates for the 2023 plan, CBO's estimates increased by between 5 percent and 10 percent in real (inflation-adjusted) terms, depending on the alternative."

These delays and cost increases are concerning, but falling behind the capabilities of increasingly aggressive U.S. adversaries would be a greater worry still. The timely introduction of the Columbia-class ships, along with the Navy's other next-generation systems, is crucial.

BUT nuclear power issues have delayed Columbia --- we'll miss the 2027 deadline.

Lagrone 24 [Sam Lagrone, 4-10-2024, Late Turbines Have 'Major Impact' on Columbia Sub Delivery Schedule, Says SECNAV, USNI News,

<https://news.usni.org/2024/04/10/late-turbines-have-major-impact-on-columbia-sub-delivery-schedule-says-secnav>, Willie T.]

This post has been updated with a statement from Northrop Grumman.

Late delivery of steam turbines for the under-construction District of Columbia (SSBN-826) is one of the main obstacles the Navy faces in delivering the nuclear ballistic missile submarine on time. Secretary of the Navy Carlos Del Toro told a House panel on Wednesday.

“One of the **most significant challenges** that we have with Columbia ... is actually the late delivery of the turbine generator to Columbia by subcontractor Northrop Grumman.” Del Toro the House Appropriations subcommittee on defense.

“That has had a major impact on the Columbia.”

The turbines must be installed before the submarine’s pressure hull is sealed and the delay has had a cascaded to the completion of other systems. USNI News understands.

The new turbine design takes the steam generated from the atomic reactors to power the ship-wide electrical grid that makes the submarine quieter than the previous Ohio-class boomers. The turbines are government-furnished equipment and have been subcontracted to Northrop Grumman. USNI News reported on the turbine delay last month.

“Northrop Grumman is fully committed to the Columbia-class program, and is fully supportive of General Dynamics Electric Boat and the U.S. Navy as we work together to deliver this program,” the company said in a statement to USNI News.

The 12-boat, \$136 billion class has repeatedly been called the **most important** Pentagon acquisition program. District of Columbia was to join the service as the **first Ohio-class** boomer –USS Henry M. Jackson (SSBN-730) is set to **decommission in 2027**.

Indeed,

Seck this week [Hope Hodge Seck, award-winning freelance reporter and editor who has covered the U.S. military and security issues since 2009, 4-9-2025, First Columbia-class Sub, Two Aircraft Carriers Face Delivery Delays, Navy Officials Tell Senate, USNI News, <https://news.usni.org/2025/04/09/first-columbia-class-sub-two-aircraft-carriers-face-delivery-delays-navy-officials-tell-senate>, Willie T.]

Likewise, nuclear aircraft carriers are facing delays as production on future Ford-class hulls are taking longer than anticipated, the officials told the Senate Armed Services seapower subcommittee.

For the Columbia-class submarines, set to replace the Ohio-class boats in the U.S. nuclear triad, lead ship District of Columbia (SSBN-826), is now set to deliver in 2029, which is 12 to 18 months behind schedule, said Rear Adm. Todd Weeks, program executive officer for strategic submarines. The next ships in the class, *Wisconsin* (SSBN-827) and *Groton* (SSBN-828), are set to follow roughly on schedule in 2032 and 2034, he said.

Investment solves delays AND reassure suppliers.

Field 22 [Benjamin R. Field, Master of Science in Program Management from the Naval Postgrad School & Nuclear Submarine Officer @ the US Navy, June 2022, ANALYSIS OF POSSIBLE SOLUTIONS TO SUPPORT THE TIMELY DELIVERY OF THE COLUMBIA CLASS SUBMARINE, Naval Postgraduate School, <https://apps.dtic.mil/sti/trecms/pdf/AD1184869.pdf>, Willie T.] **brackets in original**

In addition to seeking to alleviate the schedule strain, the CNO also thought that another avenue that should be pursued was accelerating the development of the Columbia class submarine. He assessed this could be accomplished by strengthening the submarine industrial base. A more robust industrial base would help to alleviate material supply issues which would assist in minimizing schedule delays. The larger industrial base can also increase the quality of its workforce which would minimize rework saving time, lowering costs, and increasing overall performance. One way the industrial base could be strengthened is by employing a targeted use of Title III of the Defense Production Act (DPA). According to 50 U.S.C., Title III of the DPA “provides the president a unique and broad authority to ensure the timely availability of essential domestic industrial resources to support national defense and homeland security requirements through the use of highly tailored economic incentives”. However, there were many different ways to utilize the DPA Title III. Should a purchase commitment be utilized to “create a guaranteed demand to reduce the risk for industry to make their own investments?” (Lehman, n.d.). Should a direct loan be made to help accommodate for the “the risk tolerance being [beyond that of] the commercial market?” (Lehman, n.d.). Are there any other provisions that should be considered? A final risk to schedule came from the new technologies that were being introduced on the Columbia-class. There were different opinions as to how mature the technology really is. Is conducting thorough operational testing to minimize the chance of any technical risk for major systems worth the time investment? If a flaw was discovered early, it could save large schedule delays in the future. And if minimizing technology risk was a primary consideration, would there be any interest in canceling the Columbia program and building new Ohio-class submarines? The Ohio-class are state-of-the-practice. This would likely come at the cost of performance in the competitive undersea domain, but a new line of Ohio-class submarines could certainly be created by 2031. Each of these possible solutions will come at some increased expense. Cost is another side of the triple constraint that could be optimized. How important is it to minimize the cost growth of the Columbia-class submarine program? Is it worth sacrificing schedule for cost? This option would likely only be possible if the CNO was able to alleviate schedule pressure created by the need identified in the JCIDS process by modifying the schedule in the APB. G. CONCLUSION In order to avoid the extremely undesirable outcome, the CNO knew he had to work with RADM Pappano to make some decisions. Time was ticking.

VI. CASE STUDY ANALYSIS AND CONCLUSIONS A. CASE STUDY ANALYSIS A strong acquisition case study analysis contains four vital parts: defining stakeholders, defining options and criteria, utilizing a decision matrix to make a logical decision, and presenting a final recommendation. 1. Stakeholder Analysis The Columbia-class submarine has a variety of stakeholders. The first step is to list all of the stakeholders and denote which aspects of the triple constraint they are the most concerned about. At most, each stakeholder can only choose to prioritize up to two concerns due to the limitations of the triple constraint. I have summarized the stakeholders and their concerns in Table 6

2. Define Options and Criteria Given the stakeholders and their primary concerns, the next step is to define options and decision criteria. Each option presented seeks to manage some aspect of the triple constraint. To clearly define criteria, an optimal schedule provides some type of sea-based strategic deterrent asset when it is needed such that a strategic deterrence gap is avoided, an optimal performance delivers a sea-based strategic deterrent asset that has all required capabilities to operate in a modern, competitive undersea-warfare environment while performing the mission of strategic deterrence, and an optimal cost

minimizes cost to the taxpayer while still providing all planned capabilities. In addition to the criteria of the triple constraint, I have added technological risk as my piece of decision criteria. An optimal technological risk represents a highly improbable chance of any new technologies failing or any legacy technology being unavailable that would delay schedule.

Option One – Continue Columbia-class Program, Strengthen Industrial Base and Quality Assurance Programs (Schedule and Performance Optimization)

The DPA Title III should be used to improve/expand the state of the submarine industrial base. The goal of utilizing the DPA Title III is to incentivize existing suppliers to hire new workers, improve the training programs for their current workforce, purchase new equipment or expand their facilities which can aid in the production of submarine or submarine parts, and also to attract new suppliers or sources of labor. There are multiple ways of achieving this goal. Purchase commitments could reassure existing suppliers of the future guaranteed demand for their supplies and/or labor, thereby lowering their risk (Lehman, n.d.). This would increase the likelihood a supplier would spend their money to expand capabilities to support submarine production. Knowing that the government was offering purchase commitments could attract new suppliers or sources of labor who are seeking guaranteed future work. An in-rush of new suppliers would lessen the reliance on existing suppliers, helping to lower costs for future Columbia-class SSBNs. These new suppliers could provide quality, timely materials and bring experienced workers who would increase the quality of the work performed. The greater the quality of the industrial base, the less likely the Columbia program office will have to wait for parts or conduct rework, improving the speed at which the Columbia-class submarines will be delivered.

Outside of seeking to grow the industrial base, another way to minimize the probability of schedule delays for the Columbia class submarine is to increase the thoroughness of the quality assurance program. One obstacle to conducting “intrusive” supplier audits as required by a thorough quality assurance program was COVID-19 in 2020 (O'Rourke, 2022, p. 12). However, with the pandemic slowing down in early 2021, the quality assurance program must be brought back in full force. According to the Congressional Research Service, “documents from Electric Boat indicate that standard quality assurance activities early in the Columbia program were not sufficient to manage the diminished supplier base” (2022, p. 27). If the Navy can improve its quality assurance issues there is a much greater chance of catching a quality issue before it happens saving money by avoiding rework and, most importantly, avoiding additional schedule delays.

Failure kills sub-based nuclear deterrence and cedes ground to China/Russia.

Sofrep 24 [No Author (cites Government Accountability Office), veteran owned media company that places an emphasis on reporting global affairs from the source, 10-2-2024, Columbia-Class Submarine Delays Leave America Vulnerable, Defense Budget in Peril, SOFREP, <https://sofrep.com/news/us-columbia-class-sub-delay-issue/>, Willie T.]

When we think about military defense, especially nuclear deterrence, we often picture massive submarines silently patrolling the world's oceans, ready to defend the US at a moment's notice.

One of the key players in this defense strategy is the Columbia-class submarine program, the Navy's next generation of nuclear-powered ballistic missile submarines.

But the program is reportedly facing some serious challenges—delays and cost overruns that could have bigger consequences than most of us realize.

These delays aren't just about getting a submarine ready in the water on time, as they could actually weaken our national security and seriously drain the defense budget at the same time. Here's what's going on and why it matters.

Concern #1: Impact on US National Security

The Columbia-class submarines are supposed to replace the aging Ohio-class submarines, which have been the backbone of the US Navy's nuclear deterrent for decades.

These subs carry nuclear missiles, making them a critical part of the nation's defense strategy—especially in a world we have today where rivals like Russia and China are ramping up their military capabilities.

Originally, the lead Columbia-class submarine was supposed to be delivered by October 2027, but that timeline has slipped due to difficult construction work and cost growth, among many others.

Now, according to the latest Government Accountability Office (GAO) report, we're looking at a delay of up to 16 months, pushing the delivery back to February 2029.

What does that mean? Well, for starters, if the first Columbia-class sub isn't operational by 2030, it could leave a gap in the US nuclear deterrent, which is a big deal in a world of growing geopolitical tensions—with Russia in the Atlantic and Arctic, China in the Pacific, and Iran's influence in the Middle East.

The US Navy has a tough job ahead then, ensuring that these submarines are ready to go when needed.

Without these subs, the balance of power in undersea warfare could shift in favor of countries that don't exactly have our best interests at heart.

Concern #2: The Ripple Effect on Defense Spending

Cost overruns are another massive issue for the Columbia-class program. I mean, we're talking hundreds of millions of dollars here, which is beyond the original estimates.

Not to mention how, when you consider that the US plans to build 12 of these submarines, the numbers start to add up pretty quickly.

The total price tag for the program is hovering around \$130 billion.

What's more concerning is that these extra costs don't just affect the submarine program. They could siphon money away from other critical defense projects.

It's like when you blow your home renovation budget on one room, and suddenly, you can't afford to fix the rest of the house.

The Navy has other modernization efforts to think about—fighter jets, ships, cybersecurity—and if the Columbia-class submarines keep eating up more and more funds, other parts of the military could be left high and dry.

Managing these kinds of large-scale projects is tough, no doubt about it. But the Navy has to figure out how to stay on budget without compromising the broader defense strategy.

Concern #3: Supplied Base Investment Efficiency

Here's another problem: the Navy has already poured \$2.6 billion into the submarine supplier base to make sure the Columbia-class construction stays on track.

These funds are meant to boost production, improve efficiency, and hopefully save some money in the long run. The catch? It's not clear whether these investments are actually paying off.

According to the recent GAO report, the Navy hasn't done a great job of tracking whether these investments are delivering results.

If the money being funneled into the supplier base isn't leading to more efficient production or cost savings, then what's the point?

Without clearer accountability, these investments could end up being a massive waste of resources.

Concern #4: Unmet Cost and Schedule Targets

Lastly, one of the most frustrating things about the Columbia-class program is that it consistently falls short of its cost and schedule targets.

Since 2022, the program has struggled with late materials, incomplete design products, and other production issues.

And these problems haven't gotten any better.

This isn't just an issue with submarines—it's part of a broader pattern in US defense procurement.

Big defense projects often run over budget and behind schedule, and the Columbia-class submarines are no exception.

The Navy and its contractors need to start taking a hard look at why these projects keep missing their targets and how they can better manage risks moving forward.

Future Risks and Strategic Ramifications

Looking ahead, the risks aren't just about what's happening right now.

There's real concern that delays and cost overruns could keep piling up, making the problem even worse. The longer these submarines take to build, the more expensive they become, and the harder it is to keep the project on track.

However, the bigger issue here is that America needs to stay ahead of rivals like China and Russia in undersea warfare. Both countries have been stepping up their submarine game, and the US can't afford to fall behind.

If the Columbia-class subs are delayed further, it could give adversaries an edge in a part of military defense where the US has traditionally been dominant.

Nevertheless, the GAO has been all over this issue, and their recommendations are critical for getting the Columbia-class program back on track.

"GAO is making five recommendations, including that the Navy require the shipbuilder to revise its estimated cost at completion and include thorough analysis in its reporting; and that the program identify information it needs to determine whether investments in the supplier base support Columbia class construction goals," the report recommendation reads.

GAO is calling for the Navy to revise its cost estimates and include a more detailed analysis of why these delays and cost overruns keep happening.

It's also about holding contractors accountable.

The Navy needs to make sure that the companies building these submarines are doing everything they can to stay on time and on budget. Without that accountability, these kinds of defense projects will keep running into the same problems.

You can read the rest of the Columbia Class Submarine report by GAO here.

Final Thoughts on the Matter

The delays and cost overruns plaguing the Columbia-class submarine program aren't just a headache for the Navy—they could have serious consequences for US national security and defense spending.

If the Navy can't get these submarines built on time, it risks weakening the country's nuclear deterrent at a time when global threats are on the rise. And with the costs spiraling, other parts of the defense budget could take a hit as well.

It's time for the Navy to start addressing these challenges head-on, ensuring that this critical defense project doesn't become another cautionary tale of mismanaged military spending.

The stakes are simply too high to let this one slip any further.

Extinction!

Clare '23 [Stephen Clare; Effective Altruism Writer; June 2023; "Great power war"; 80000 Hours; <https://80000hours.org/problem-profiles/great-power-conflict/>; accessed 12-05-2024]

A modern great power war could see nuclear weapons, bioweapons, autonomous weapons, and other destructive new technologies deployed on an unprecedented scale.

It would probably be the most destructive event in history, shattering our world. It could even threaten us with extinction.

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Nuclear weapons are complemented and amplified by a variety of other modern military technologies, including improved missiles, planes, submarines, and satellites. They are also not the only military technology with the potential to cause a global catastrophe — bioweapons, too, have the potential to cause massive harm through accidents or unexpected effects.

AND Columbia subs cap nuclear escalation

Osborn 25, President and Editor in Chief of the Center for Military Modernization. Previously served at the Pentagon as a Highly Qualified Expert with the Office of the Assistant Secretary of the Army—Acquisition, Logistics & Technology. (Kris, Warrior Maven, "Why The Navy's Columbia-Class Nuclear-Armed Submarine May Save The World," Warrior Maven, https://warriormaven.com/uncategorized/25539#google_vignette, accessed on 3-6-2025)

Why **The Navy's Columbia-Class Nuclear-Armed Submarine May Save The World**

After years of science and technology, prototyping, and advanced design specs, the U.S. Navy is now building its first Columbia-class submarine, slated to arrive at the end of the decade.

Columbia-Class Submarine: What Do We Know? **Lurking secretly in dark waters around the world and holding potential adversaries at risk of nuclear destruction from unknown locations, US Navy's nuclear-armed ballistic missile submarines offer the backbone of U.S. strategic deterrence.**

Undersea strategic deterrence essentially guarantees second-strike retaliatory catastrophic destruction of any adversary who attacks the U.S. with nuclear weapons, thus preventing war by ensuring the complete annihilation of any country that attacks with nuclear weapons.

The **promise of total destruction**, somewhat paradoxically one might say, **keeps the peace**

Columbia-Class Submarine – Lurking Threat

This conceptual premise is why, **for many years now, the Pentagon has identified the now emerging Columbia-class nuclear-armed ballistic missile submarines as a number one DoD acquisition priority.** After years of science and technology, prototyping, and advanced design specs, the U.S. Navy is now building its first Columbia-class submarine, slated to arrive at the end of the decade.

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Cohen 24 (Dr. Ariel Cohen, Ph.D. is a Senior Fellow at the Atlantic Council and the Founding Principal of International Market Analysis, a Washington, D.C.-based global risk advisory boutique. He is also Managing Director of the Energy, Growth, and Security Program (EGS) and a Senior Fellow with the International Tax and Investment Center (ITIC). 7 June 2024, "China And Russia Now Dominate The Global Nuclear Trade" Forbes, <https://www.forbes.com/sites/arielcohen/2024/06/07/china-and-russia-now-dominate-the-global-nuclear-trade/>, DOA: 3/5/25) LLO

Russia is not alone in surpassing the US. **China is also far ahead of the US in the nuclear energy industry. China's nuclear power industry has retained its domestic focus, with twenty-three power plants under construction in China as of July 2023.** This is due to **increasing energy demand**, as China continues to develop its economy. The United States is constructing a **single nuclear power plant. While China has refined its nuclear power production process, the last plant built in the US arrived 7 years late and 17 billion dollars over budget, as a testament to America's byzantine permitting and environmental review system. China has built upon this expertise also to begin supplying reactors abroad. The China National Nuclear Corporation and China General Nuclear Power Group have developed a third-generation reactor called Hualong One.** This new reactor began operations in **2021** in Fuqing. **In 2023, China began construction on the Chashma-5 nuclear power plant in Pakistan, which will use Hualong One reactors. Such actions contribute to China's capacity to construct infrastructure abroad and expand its influence.** The American nuclear power industry was once the world's envy, peaking with **112 operational reactors** in 1990, with America on a path to carbon neutrality much earlier than current predictions. **34 years later, the United States has lost nearly a third of its operational nuclear reactors, has built almost no new ones, and its average reactor age is decades old. If nothing is done to**

rectify this, in the next 10-15 years, scores of nuclear reactors will have to be retired as their operational lifecycles end, and as a result, America will have to contend with [nearly 20% of its electricity capacity](#) evaporating.

And China is expanding abroad. Kim 23

Lami Kim, 4-24-2023, "Nuclear Belt and Road and U.S.-South Korea Nuclear Cooperation", No Publication,

<https://www.csis.org/analysis/nuclear-belt-and-road-and-us-south-korea-nuclear-cooperation>

Nuclear exports are an important component of the Belt and Road Initiative, Xi Jinping's signature infrastructure and development project abroad. Chinese nuclear industry officials have said that [China could build](#) as many as [30 nuclear reactors abroad](#) worth \$145.5 billion [by 2030](#). [China](#) has already [built](#) four nuclear [reactors](#) and is currently building two more [in Pakistan](#). It has also entered the [United Kingdom's](#) nuclear market by financing a third of the French construction of the United Kingdom's new nuclear reactors. China has also recently signed a contract to build a Hualong One nuclear reactor in [Argentina](#), [and](#) is currently in negotiations with Saudi Arabia and Kazakhstan, among many [others](#).

Russia is as well.

Cohen 24 (Dr. Ariel Cohen, Ph.D. is a Senior Fellow at the Atlantic Council and the Founding Principal of International Market Analysis, a Washington, D.C.-based global risk advisory boutique. He is also Managing Director of the Energy, Growth, and Security Program (EGS) and a Senior Fellow with the International Tax and Investment Center (ITIC). 7 June 2024, "China And Russia Now Dominate The Global Nuclear Trade" Forbes,

<https://www.forbes.com/sites/arielcohen/2024/06/07/china-and-russia-now-dominate-the-global-nuclear-trade/>, DOA: 3/5/25) LLO

Through Rosatom, Russia remains the global leader in nuclear reactor construction. According to the World Nuclear Strategy Report, as of July 2023, Russia had [twenty-four](#) nuclear reactors under [construction](#) in seven countries: China, India, Turkey, Egypt, Bangladesh, Iran, and Slovakia. For comparison, the US was constructing zero. Russia dominates the nuclear industry in more areas than just reactors. They also have the [largest](#) uranium conversion and enrichment industries in the world, at 38% and 46% of international capacity, respectively, in 2020. This makes it a major fuel exporter as well. [Russia exported over \\$1 billion worth of nuclear energy-related products from February 2022-2024](#). [Two of the countries](#) in which Russia is constructing nuclear power plants, Turkey and Slovakia, [are NATO members](#). They are not alone amongst the collective West in enabling Russia's nuclear dominance while ostensibly being committed to

containing the Kremlin. As my colleague Wesley A. Hill wrote, Russian-enabled [geopolitical turmoil in Africa](#), which Russia is using to [try to acquire formerly French uranium assets](#), helped force Europe to [double its import](#) of Russian uranium in 2023. The US was no better, remaining [dependent on Russian nuclear exports](#) even after the war in Ukraine restarted in 2022. The US [imported Russian nuclear fuel](#) until May 14th, 2024, over two years after Russia's invasion of Ukraine began, from the same entities that the White House sanctioned.

And, America is losing influence

Policy Circle 24 (Policy Circle is a digital platform that offers in-depth coverage of public policy issues in governance, environment, and society. It was launched in 2020 by a group of policy experts who share a vision of promoting evidence-based policymaking and constructive policy dialogue. It also organises summits, roundtables, and online discussions to bring together policymakers, researchers, corporate executives, professionals, and other stakeholders to deliberate on policy issues. December 27, 2024 “End of American hegemony: Can the superpower reinvent power for the 21st century” Policy Circle, <https://www.policycircle.org/world/end-of-american-hegemony/>, DOA: 3/28/25) LLO

In 2010, a historian predicted that the American hegemony might end by 2025 — not with a bang but with a whimper — as domestic divisions deepened and rival powers rose to challenge its authority. Today, that prediction appears prophetic as America faces increasing pressures from within and outside. Even as the US retains military dominance and an economy capable of immense influence, **the structural underpinnings of its global power are eroding. This decline, though not necessarily terminal, signals a transition away from the so-called American Century. Historically, the US leveraged its unmatched economic strength, technological innovation, and cultural influence to dominate the post-World War II global order. However, the foundations of the American hegemony are crumbling. The US share of global GDP has steadily declined,** falling from 50% in the mid-20th century to approximately 15% today when adjusted for purchasing power parity. **The globalisation, initially championed by the US, has redistributed industrial power, with China emerging as a key beneficiary. China's rise has reoriented global economic networks, particularly in the Global South.** In contrast to America's interventionist foreign policy, **China has cultivated influence through infrastructure investments, soft power campaigns,** and state-sponsored media. The United States, while still a major player, has failed to present an alternative vision that resonates with developing nations, where perceptions of Chinese leadership are increasingly favourable.

Domestic production is critical to hegemony

Price et al 24 (Christel Hiltibran, Director of International Policy, Climate and Energy Program, Rowen Price, Policy Advisor for Nuclear Energy, Ryan Norman, Senior Policy Advisor for Clean Energy Finance, Climate and Energy Program, Alan Ahn, Deputy Director for Nuclear, 31 January 2025, “Trump Has Been a China Hawk on Nuclear Energy. But Congress Could Compromise That During Reconciliation.”, Third Way, <https://www.thirdway.org/memo/trump-has-been-a-china-hawk-on-nuclear-energy-but-congress-could-compromise-that-during-reconciliation#:~:text=A%20strong%20US%20nuclear%20energy,valuable%20hundred%2Dyear%20geopolitical%20relationships.>, DOA 3/1/2025) ESR

President **Trump has long considered himself a China hawk**, stoking a trade war with the country, supporting ever-increasing tariffs on its goods, and using aggressive rhetoric to combat its growing global influence. **But his approach has a blind spot, failing to mitigate China's increasing dominance in the energy sector, especially in nuclear energy development and deployment.** Until we confront China's rising role in global energy markets, **the US will continue to cede market share and lose geopolitical influence, threatening national security both in the US and among our allied nations.** The US needs a synchronized foreign policy to counter Chinese attacks on American hegemony. But since the election, **the incoming administration and Congress have signaled misaligned approaches to foreign energy policy.** The Trump Administration's [Day 1 executive orders](#) reaffirmed the President's commitment to domestic energy production—now it's up to Congress to ensure legislation is going to support energy goals. Nuclear Energy Must Be a Foreign Policy Priority Beyond bilateral trade barriers, the US must also dominate critical global industries to remain competitive. **There is broad consensus that investments in national defense, space, artificial intelligence, and quantum computing will help make America more secure and more prosperous. The same is true of investments in nuclear energy.** A robust domestic nuclear supply chain has corollary benefits, including reliable energy supply, that are foundational to our [defense](#) and [technology sectors](#). Moreover, **the strength of our nuclear industry directly supports our competitiveness abroad, which in turn affects our ability to uphold the highest global norms in nuclear security and nonproliferation.** **Failure to compete overseas will enable China, Russia, and other rivals to erode our influence on these international standards** and cement [century-long geostrategic partnerships](#) around the world. **Putting the US at the forefront of global civil nuclear markets will make us stronger, more secure, and more influential on the global stage.** Our adversaries understand the stakes. **China and Russia have state-owned, heavily subsidized nuclear industries that are a key part of their efforts to gain allies and influence throughout the developing world.** China and Russia view nuclear exports as a way to develop century long partnerships **in Africa, Asia, and Eastern Europe.** Their interest in advanced nuclear power is less about economics, and more about influence. The competition is well underway and the United States is losing. According to the International Atomic Energy Agency, **85% of all new reactors currently under construction in 2024 are Russian or PRC designs; 0% are US designs.** This year, President Trump and the new Republican Congress have an opportunity to do just that—through budget reconciliation. Trump Could Cede Critical Geopolitical “Energy Dominance” to China in His First 100 Days by Compromising America's Nuclear Industry—But It's Not Too Late Put simply, **if we want to outcompete China, Congress needs to continue to prioritize clean energy.** The incoming Trump administration has made no secret of its hostility to the Inflation Reduction Act (IRA) and its clean energy provisions, especially its investments in wind and solar. But despite recent bipartisan alignment in support of nuclear energy, **Trump's agenda not only targets renewables but may also incidentally deal a significant blow to programs supporting nuclear development and demonstration in the US.** During the 117th Congress, **IRA and the Bipartisan Infrastructure Law (BIL) created tax credits, grants, and loan programs to finance the research, development, demonstration, and even the deployment of emerging clean energy technologies,** including nuclear. In a flurry of signals issued during the lame-duck period, the incoming administration and Republican Congressional leadership have made clear **that many of these programs are on the chopping block in the first 100 days of the second Trump administration.** In competition with state-backed civil nuclear programs such as China, **the US needs to bolster its federal government funding for nuclear, not decrease it. China is churning out large reactors at home, demonstrating (i.e., building and operating) advanced reactor technologies, and marketing advanced reactors cheaply along its “Belt and Road.”** To stay relevant in this race for international market share, **the US must rapidly finance the demonstration and subsequent commercialization of US nuclear small modular reactors (SMRs) and advanced nuclear reactors. The time is now, in the 2025 reconciliation process, to save this critical sector from opening its global market to China.** Why? **The**

decisions the US government makes this year will dictate whether US nuclear developers have the resources they need to keep pace and ground test these technologies. In the interest of national security and to ensure US competitiveness, Congress must robustly appropriate funding for advanced nuclear demonstrations and maintain federal programs critical to the scale-up of these technologies.

The following programs are all essential to preserve or expand during budget reconciliation.

Affirming enables exports

Bowen et al 20 (Matt Bowen is a research scholar at the Center on Global Energy Policy at Columbia University School of International Public Affairs and a senior fellow at the Atlantic Council Global Energy Center. Jackie (Kempfer) Siebens is a senior policy adviser for the energy and climate program at Third Way and a senior fellow at the Atlantic Council Global Energy Center. Jennifer T. Gordon is the managing editor and senior fellow for nuclear energy at the Atlantic Council Global Energy Center. 10/7/20, “Strengthening cooperation with allies could help the United States lead in exporting carbon-free nuclear energy”, The Atlantic Council,

<https://www.atlanticcouncil.org/blogs/energysource/strengthening-cooperation-with-allies-could-help-the-united-states-lead-in-exporting-carbon-free-nuclear-energy/> // DOA: 3/3/25)JDE

First, **the federal government should establish a more comprehensive and coordinated interagency system focused on the development and deployment of civilian nuclear technologies**, which would **support bringing advanced nuclear power to the global market.** This would involve establishing a collaborative network of nuclear-specific staff positions embedded in the collection of government agencies that **play a meaningful role in safely and securely developing**, deploying, and exporting US energy **technologies**. Similar to the “Team USA” whole-of-government approach first initiated under the Obama Administration, a network of nuclear-specific staff positions could be located across different US agencies including: the Department of Energy, Department of State, Nuclear Regulatory Commission (NRC), White House Office of Science and Technology Policy, National Security Council (NSC), Department of Commerce, and any future Climate Office. While the Obama Administration created an NSC role to coordinate interagency nuclear policy, and the DOE report released earlier this year, [Restoring America's Competitive Nuclear Advantage](#), recommended reinstating that role, there is currently no high-level mechanism for interagency coordination on US nuclear exports. And, **since it is difficult to export a product that lacks a domestic market, continued policy support for constructing advanced reactors here in the United States is imperative.**

Government support is the focal point to global expansion. Congress reports,

Madison Freeman [Madison Freeman is a research associate for energy and U.S. foreign policy at the Council on Foreign Relations, and an energy and environment fellow with Young Professionals in Foreign Policy], xx-xx-xxxx, “How Russia, China Use Nuclear Reactors To Win Global Influence”, Congress.gov, <https://www.congress.gov/115/meeting/house/108584/documents/HMKP-115-IF00-20180718-SD026.pdf>

Chinese firms are constructing nuclear plants in Romania, Pakistan, and the United Kingdom, with others to be built in Argentina and Iran—and the list of projects could expand substantially. The chairman of the China National Nuclear Cooperation, a Chinese nuclear vendor, has identified 41 countries along the Belt and Road as potential sites for nuclear power projects. China also aims to establish long-term contracts for the construction and operation of nuclear plants, and captures new markets by covering upfront costs and providing technology and construction services. Beijing is covering 82 percent

of the reactor costs in Pakistan, and 33 percent of the United Kingdom's Hinkley Point project. These projects come with more than a monetary price tag. China in particular has a history of using predatory lending practices to make strategic gains. Last year, when Sri Lanka could not pay the debts it owed to Chinese companies for infrastructure projects, it was forced to sign over control of the major port of Hambantota to Beijing. China may expand this tactic to make political or territorial gains in key parts of the world by leveraging nuclear power plant debts. Meanwhile, U.S. nuclear companies find it nearly impossible to compete against government-backed competitors motivated by political goals more than profit. The state-owned nuclear companies of China and Russia are directly lobbied for by top leaders—Vladimir Putin has aggressively promoted Rosatom's bids abroad, including those in the Middle East and South America. Russia has also used other forms of soft power to promote its nuclear presence abroad, including funding youth competitions in Africa and building a research center in Bolivia. Without this form of state support, U.S. companies find themselves at a disadvantage as they try to sell their product to foreign governments.

Exports secure positive global relationships

Graham 19 (Thomas Graham is a retired diplomat who helped negotiate every international arms control and nonproliferation agreement from 1970 to 1977, co-chair of the Nuclear Energy and National Security Coalition, 5/29/19, "National security stakes of US nuclear energy" The Hill, <https://thehill.com/opinion/national-security/445550-national-security-stakes-of-us-nuclear-energy/>, DOA: 3/4/25) ST

We have dedicated our careers to controlling the destructive potential of nuclear weapons. But since the Atoms for Peace era, U.S. leadership in supplying peaceful nuclear energy technology, equipment, and fuel to the world has been important for world development and therefore critical for the United States to establish and enforce standards for nuclear safety, security and nonproliferation. But in recent decades, the U.S. share of international commercial nuclear energy markets has diminished, and so with it has the United States' ability to influence global standards in peaceful nuclear energy. The critical moment for U.S. leadership in nuclear energy is when a country is developing nuclear energy for the first time. The supplier country and the developing country typically forge a relationship that endures for the 80- to 100-year life of the nuclear program. Unlike a coal or gas plant, nuclear reactors need specialized fuel and maintenance. Once established, the bilateral commercial relationship is not easily dislodged by a rival nation, providing the supplier profound and lasting influence on the partner's nuclear policies and practices. Russia and China have identified nuclear energy as a strategic export, to be leveraged for geopolitical influence as well as for economic gain. According to a recent analysis, Russia is the supplier of more nuclear technology than the next four largest suppliers combined, and China is quickly emerging as a rival. If the United States fails to compete in commercial markets, it will cede leadership to these countries on nuclear safety, security and nonproliferation, as well as foreign policy influence. As the competition intensifies to deliver the next generation of nuclear power technologies, U.S. nuclear leadership is approaching a watershed opportunity. Simpler, scalable, and less expensive, small and advanced reactors are commercially attractive to an expanded range of markets — particularly in Africa, Asia and the Middle East. The United States has the world's best training and development programs, unmatched regulatory experience, and multiple small and advanced reactor designs; we should be the easy choice for the next generation of nuclear technology. But early U.S. engagement in these important geopolitical regions is critical. Without it, Russia and China will lock up future nuclear markets through MOUs and other bilateral agreements. And for

addressing the national security risks of climate change, nuclear energy is not just an option but a necessity. Developing nations that are planning to meet power and water needs for large and growing populations must have reliable, demonstrated, zero-emission nuclear power in order to meet global climate goals as well. Advanced reactors are integral to these goals. In the United States, nuclear energy is responsible for a fifth of the United States' total electricity and more than 55 percent of our emissions-free energy, but the pace of domestic construction of new natural gas plants far exceeds the few nuclear plants under development, and the existing fleet is retiring prematurely at an alarming rate.

Which brings us back to the domestic nuclear industry. **U.S. global competitiveness and leadership are inextricably linked to a strong domestic nuclear program.** **Without a healthy domestic fleet of plants, the U.S. supply chain will weaken against international rivals. Russia has brought six new plants online in the past five years and has six more plants currently under construction. In the same period, China has brought 28 new plants online and has 11 others under construction. These domestic projects provide Russia and China with a robust supply chain, an experienced workforce, and economies of scale that make them more competitive in bidding on international projects. Unless we continue to innovate and build new plants, we will cease to be relevant elsewhere.** Even our own domestic energy security is supported by nuclear power. The nuclear plants operating today are the most robust elements of U.S. critical infrastructure, offering a level of protection against natural and adversarial threats that is unmatched by other plants. Because the nation's grid supplies power to 99 percent of U.S. military installations, large scale disruptions affect the nation's ability to defend itself. **We can regain U.S. leadership in nuclear energy. The key steps are to maintain the domestic reactor fleet, with its reservoir of know-how, and to assist American entrepreneurs in developing the next generation of the technology.**

US hegemony deters multiple revisionists

Ignatieff 24 (Michael Ignatieff is Professor of History at Central European University and the author of *On Consolation: Finding Solace in Dark Times* (Metropolitan Books, 2021)., , "The Threat to American Hegemony is Real," 3-15-2024,

<https://www.project-syndicate.org/commentary/us-western-hegemony-vulnerable-to-russian-chinese-coordinated-challenge-by-michael-ignatieff-2024-03>, // accessed 10-29-2024)ops

The post-1945 world order – written into international law, ratified by the United Nations, and kept in place by the balance of nuclear terror among major powers – **is hanging by a thread.** **The United States is divided against itself and stretched to the limits of its capabilities. Europe is waking up to the possibility that, come November, America may no longer fulfill its collective-defense obligations under Article 5 of the NATO treaty.** Faced with this new uncertainty, Europe is cranking up its defense production, and European politicians are screwing up the courage to persuade their electorates that they will need to ante up 2% of their GDP to guarantee their own safety. **The Western alliance** doesn't just face the challenge of doubling down on defense while maintaining unity across the Atlantic. It also now **faces an "axis of resistance" that might be tempted to threaten Western hegemony with a simultaneous, coordinated challenge.** The lynchpin of this axis is the Russia-China "no-limits" partnership. While the Chinese supply the Russians with advanced circuitry for their weapons systems, Russian President Vladimir Putin ships them cheap oil. **Together they have imposed autocratic rule over most of Eurasia.** If **Ukraine's exhausted defenders are forced to concede Russian sovereignty over Crimea and the Donbas region, the Eurasian axis of dictators will have succeeded in changing a European land frontier by force. Achieving this will threaten every state on the edge of Eurasia: Taiwan, the Baltic countries, and even Poland.** Both **dictatorial regimes will use their vetoes on the UN Security Council to ratify conquest, effectively consigning the UN Charter to history's dustbin. This partnership of dictators works in tandem with a cluster of rights-abusing renegades,** led by Iran and North Korea. The **North Koreans provide**

Putin with artillery shells while plotting to invade the rest of their peninsula. The Iranians manufacture the drones that terrorize Ukrainians in their trenches. Meanwhile, **Iran's proxies – Hamas, Hezbollah, and the Houthis – are helping Russia and China by tying down America and Israel.** Unless the US can force Israel into a long-term ceasefire, **it will find itself struggling to control conflicts on three fronts (Asia, Europe, and the Middle East).** Not even a country that outspends its rivals on defense by two to one can maintain a war footing simultaneously across so many theaters. The idea that democracies around the world will join up with America and Europe against the authoritarian threat seems like an illusion. **Instead of joining with the embattled democracies of the Global North, the rising democracies of the Global South – Brazil, India, and South Africa – seem unembarrassed to be aligning with regimes that rely on mass repression,** the cantonment of entire populations (the Uighurs in China), and shameless murder (Navalny being only the most recent example). To be sure, **the authoritarian axis currently is united only by what it opposes: American power.** It is otherwise divided by its ultimate interests. The Chinese, for example, cannot be overjoyed that the Houthis are blocking freight traffic through the Red Sea. The world's second most powerful economy doesn't have all that much in common with an impoverished Muslim resistance army or with theocratic Iran. Moreover, **both Russia and China remain parasitic beneficiaries of a global economy that is sustained by US alliances and deterrence.** That is why they still hesitate to challenge the hegemon too directly. However, like sharks, they smell blood in the water. **They have not only survived US sanctions but continued to prosper, replacing their dependence on embargoed markets with new markets in Latin America, Asia, and India.** Both Russia and China have discovered that American control of the global economy is not what it once was. **This discovery of American weakness might tempt them to risk a joint military challenge.** As matters stand, **US diplomacy and deterrence have successfully kept the axis divided.** CIA Director William Burns and National Security Adviser Jake Sullivan are keeping the channels open to China. Blowback American strikes against Iran have apparently convinced the theocrats to rein in Hezbollah and the militias in Iraq – though not the Houthis, whom nobody seems able to control. It doesn't take strategic genius to see the opportunity China and Russia might be contemplating. **If they decided to mount an overt challenge to the American order – for example, with a coordinated, simultaneous offensive against Ukraine and Taiwan – the US would struggle to rush weapons and technology into the breach. Nuclear weapons would not necessarily deter China and Russia from risking a coordinated attempt to take Taiwan and the rest of Ukraine.** All parties would pay a horrendous price, but **Russia has shown what it is willing to expend in Ukraine, and both China and Russia may believe that there will never be a more opportune moment to overthrow American hegemony. If they were to combine forces, we would face the most serious challenge to the global economic and strategic order since 1945.** Nobody has any idea what the world would be like on the other side of such a confrontation. We cannot even assume, as we have always done, that America would prevail if faced with a simultaneous challenge from two formidable powers. If a pessimist is someone who imagines the worst in order to forestall it, we should all be pessimists. **Keeping the authoritarian axis from becoming a full-fledged alliance should be America's first-order priority.**

Great power war would be detrimental

Clare 21 (Stephen Clare: Research Fellow at the Forethought Foundation for Global Priorities Research Fellow, November 2021, "Great Power Conflict," https://dkqj4hmn5mkt.cloudfront.net/Great_Power_Conflict_report_Founders_Pledge_e4124df2ac.pdf, Founders Pledge .//. DOA: 12/11/24) TZL

This report explores issues at the intersection of international relations, conflict studies, and longtermism. In it, we draw extensively on the mainstream international relations literature but focus specifically on understanding the potential effects of war on the long-term future. Taking **a long-term view focuses our attention on the risk a Great Power war poses to humanity's future potential. Extinction, an unrecoverable collapse of civilization, or a permanent end to humanity's growth** and progress **would all destroy the long-term potential of our species.** We call events that could lead to one of

these scenarios **existential risks**.² Such an event, if it occurred, would be unprecedented in human history. It would cause unimaginable suffering for everyone alive today and extinguish any possibility for trillions of our would-be descendants to live happy lives. Some of these global catastrophic risks, like an asteroid impact, are direct risks. By contrast, Great Power conflict is a risk factor: it is connected to multiple other risks, and raising or lowering the amount of conflict affects the seriousness of the threats we face in these other areas. In section 4 of this report we consider several concrete pathways through which Great Power conflict poses a global catastrophic risk. We will sort these pathways into three broad categories. First, we consider ways in which Great Power conflict poses a risk even without a full-blown war breaking out. For example, a new Cold War could hasten the development of dangerous technologies or cause a breakdown in cooperation that precludes international agreements to mitigate other existential risks. Second, a Great Power war could itself be a global catastrophic risk. In an all-out war between Great Power nations, weapons with the potential to kill everyone on earth or irreparably damage civilization could be used. Or, in the aftermath of a major war, the victorious side could emerge as a global hegemon that is able to use advanced technologies to lock in its sub-optimal values.³ Third, a Great Power war could weaken humanity and leave us more vulnerable to subsequent disasters, like a serious pandemic.

C3: AI

China is using nuclear power to get the AI edge. Rio Times 24

Rio Times, 12-17-2024, "Nuclear Power: The Unsung Engine Driving China's Bold A.I. Ambitions", The Rio Times,
<https://www.riotimesonline.com/nuclear-power-the-unsung-engine-driving-chinas-bold-a-i-ambitions/>
// Lunde

Notably, China began operating the world's first fourth-generation nuclear power plant, the 200 MW Shidaowan-1 in Shandong province, in December 2023. It's a strategic move, aligning these powerhouses with emerging tech clusters to ensure AI development never lacks for energy. The United States, once the undisputed leader in both nuclear technology and AI research, now finds itself in a precarious position. It still had 93 reactors at commercial power plants as of August 2023, totaling about 94.7 million kW in 2022, but new large-scale expansions face regulatory hurdles and high costs. This slowdown could jeopardize its AI edge. Chips of Power: The Role of Semiconductors in the Battle for Global Dominance Europe faces its own challenges, with France struggling to modernize aging reactors and Germany's decision to abandon nuclear power potentially undermining its ability to feed large-scale AI systems all together. India and Japan, despite clear technical capabilities, remain constrained by slow expansions and public caution. This isn't just about bragging rights. The ability to train massive AI models, run complex simulations, and power vast data centers could determine which nations lead in fields from healthcare to finance to national security. Without reliable baseload power, future AI giants may find themselves held back.

Data centers are booming but shortages are restricting growth

Patel 25 (Sonal Patel, POWER senior editor, 3-3-2025, "The SMR Gamble: Betting on Nuclear to Fuel the Data Center Boom", POWER Magazine,
<https://www.powermag.com/the-smr-gamble-betting-on-nuclear-to-fuel-the-data-center-boom/>,
DOA: 3/7/2024)ET

That has dramatically raised the stakes, igniting a desperate frenzy across both the power industry—which must generate and deliver reliable electricity for a variety of emerging large load consumers—and the data center industry, which is scrambling to procure firm scalable energy to sustain its explosive growth, now and well into the future. The stakes are fueled by real fear. **In November, research firm Gartner projected that power required for AI data centers could reach 500 TWh per year by 2027, a 2.6x increase from 2023 levels. It warned that power shortages could restrict 40% of AI data centers by 2027 and drive up energy costs.** The upfront cost of power is no longer the deciding factor for data centers, speakers at the [Sustainable Data Centers Summit in Dallas, Texas](#), suggested in early February. “It’s crazy because we look at like the state of Oregon is about 6 GW, and you have these large hyperscalers [asking] ‘Can I get 6 GW too?’ ” said Mohammed Hassan, senior technical program manager for Amazon Web Services (AWS) Sustainability. Hassan suggested the industry has had to rethink how it approaches energy planning and procurement completely to align with incentives, address regulatory hurdles, and secure long-term reliability. “Solar and wind has taken off in the lead. But if you look at the needs of 2045, in trying to meet the Paris Agreement, solar and wind won’t be enough, so you have to look at what’s the next step.” At the conference, speakers pointed to potential alternatives that could perform over the short term: natural gas as a “bridge fuel,” carbon capture as a potential future solution, energy storage solutions for flexibility and to promote grid resilience, and renewable diesel as a cleaner backup power option. But to meet long-term goals, the industry is willing to bet on nuclear power for its many benefits—despite the significant challenges that remain.

The answer to AI power demand is nuclear. Brumfiel 24

Geoff Brumfiel, 12-8-2024, "Artificial Intelligence wants to go nuclear. Will it work?", NPR,
<https://www.npr.org/2024/12/09/nx-s1-5171063/artificial-intelligence-wants-to-go-nuclear-will-it-work>
// Lunde

Big tech firms have long promised to grow sustainably, and in recent years they've pledged to slash or even eliminate their greenhouse gas emissions. Initially, they tried to do so with solar, wind and hydroelectric power. "If you went back a decade, they were all focused on being 100% renewable-energy powered," says Ted Nordhaus, executive director of the Breakthrough Institute, a Berkley, Calif.-based environmental think tank that has studied nuclear power and the tech sector. Large tech companies purchased power from renewable sources, but Nordhaus says they drew criticism, because the purchase agreements often left parts of their demand uncovered. **For example, purchasing power from a solar plant does little to reduce emissions during night time operations. Over the years, some companies have moved towards 24/7 matching of their demand with clean energy supply. Nordhaus says that change, together with the anticipated and enormous power requirements of AI, have left nuclear power as one of the few solutions.** "I think nuclear is probably the most cost-effective current technology stopgap that we have," Strubell agrees. **Wind or solar are just too intermittent** and "the size of the battery you would need to build next to a data center in order to support these workloads is enormous and it would be incredibly expensive." Given the looming energy needs, paying to restart a plant like Three Mile Island seems like a bargain for a company like Microsoft. **"You're talking about data centers that are very power intensive, 24 hours a day, seven days a week independent of whether the sun is shining or the wind is blowing,"** says Hanson, who is trained as a nuclear engineer. **"It's a perfect match for nuclear energy."** Hanson says that Constellation will have the plant, which has been renamed the Crane Clean Energy Center, up and running by 2028.

High capacity is crucial. USDE 21

US Department of Energy, 3-24-2021, "Nuclear Power is the Most Reliable Energy Source and It's Not Even Close", Energy.gov,
<https://www.energy.gov/ne/articles/nuclear-power-most-reliable-energy-source-and-its-not-even-close>
// Lunde

As you can see, **nuclear energy has** by far the **highest capacity** factor of any other energy source. This basically means nuclear power plants are producing maximum power more than 92% of the time during the year. That's about nearly **2 times more than** natural gas and **coal** units, and almost **3 times or more** reliable **than wind and solar** plants. Nuclear power plants are typically used more often because they require less maintenance and are designed to operate for longer stretches before refueling (typically every 1.5 or 2 years). Natural gas and coal capacity factors are generally lower due to routine maintenance and/or refueling at these facilities. **Renewable plants** are considered intermittent or variable sources and are mostly **limited by a lack of fuel** (i.e. wind, sun, or water). As a result, these plants need a backup power source such as large-scale storage (not currently available at grid-scale)—**or they can be paired with a reliable baseload power like nuclear energy**. A typical nuclear reactor produces 1 gigawatt (GW) of electricity. That doesn't mean you can simply replace it with a 1 gigawatt coal or renewable plant. **Based on the capacity factors above, you would need almost two coal or three to four renewable plants (each of 1 GW size) to generate the same amount of electricity onto the grid.**

And the aff is scalable quickly, 2 warrants

1. SMRs Columbus 23

Olivia Columbus, 02-xx-2023, "Small Modular Reactors (SMRs): A Beginner's Guide", No Publication, <https://www.lastenergy.com/blog/small-modular-reactors-smrs-a-beginners-guide>

Unlike the reactors before them, some SMRs, like Last Energy's PWR-20, are truly modular, meaning that all of their systems and components are factory-assembled and easily transported as units to other locations for installation. With an SMR, you're not building a reactor from the ground up: you're simply assembling the existing pieces. **Compared to preconstructed reactors and partially modular SMRs, the PWR-20 can be assembled quickly on-site. The speed to delivery is less than 24 months, while traditional, non-modular reactors can take over five years to build – and sometimes, decades.** Case in point: in the U.S., construction on the Vogtle nuclear plant began in 2012 with projected startup dates of 2016 and 2017. Yet in 2023, it's still under construction and at least \$16 billion over budget.

SMRs are key for stability. Hurtado 25

Jorge Hurtado, "AI goes nuclear: Can small modular reactors meet AI's energy demands?," January 21, 2025 // Arham S.

<https://www.prescouter.com/2025/01/can-small-modular-reactors-address-ai-growing-energy-demands/>

×—B Jorge Hurtado, xx-xx-xxxx, "AI goes nuclear: Can small modular reactors meet AI's energy demands?," PreScouter, <https://www.prescouter.com/2025/01/can-small-modular-reactors-address-ai-growing-energy-demands/> Our Insights & Work How We Help Clients About Us Work On Our Projects How we help clients in All Topics Contact us Article January 2025 AI goes nuclear: Can SMRs meet AI's huge energy demands? By Jorge Hurtado Artificial intelligence drives progress, but its energy demands come at a cost. A single ChatGPT query uses about ten times the energy of a typical Google search, which consumes around 0.3 watt-hours. Training GPT-3 consumed 1,287 MWh and consequently emitted 502 tons of CO₂ – similar to driving a car to the moon and back. **AI's reliance on electricity could reach unprecedented levels. By 2030, AI is expected to account for around 5% of Europe's total electricity use, up from the current 2%.** As AI grows resource-intensive and emissions increase, companies must turn to carbon-free energy sources. **Small modular reactors** present a promising pathway to sustainably meet AI's energy demands while addressing regulatory and scalability challenges. **Despite their potential, SMRs are still in the early stages of development, currently at technology readiness levels (TRL) 5–6. The deployment of the first small modular reactors is expected**

by 2030 at the earliest. How Investments in Third Wave AI Are Generating 5x Returns What strategies are helping businesses achieve 5x returns on their AI investments? [DOWNLOAD REPORT](#) What are small modular reactors? A small modular reactor (SMR) is a nuclear reactor that produces energy through nuclear fission. In this process, the nucleus of a heavy atom, like uranium, splits into two smaller parts, releasing a large amount of heat. The produced heat is then used to generate electricity. SMRs are smaller and simpler than traditional nuclear plants. They are made from compact, factory-built parts that can be assembled as needed. SMRs can power cities, provide heat for factories, or turn seawater into fresh drinking water. Why are SMRs important? SMR's parts are factory-made, faster, and cheaper to build, reducing labor and construction time to as little as three years, compared to up to 12 years for traditional plants. Compact SMRs, for instance, can be used in different locations (e.g., small markets, isolated areas, and places with limited water). In addition, SMRs can be scaled to match energy needs, replace old plants, and work alongside other zero-emission sources. SMR projects can boost nuclear energy, potentially creating 7,000 jobs and generating over \$1 billion in sales for a 100-megawatt plant. Why does AI consume so much energy? AI's energy demands start with the massive energy needed to train large models. GPT-4 requires processing vast datasets through extensive calculations across thousands of high-performance servers. Training GPT-3 used around 1.3 GWh of electricity, equivalent to fully charging over 100 million smartphones. Data centers engage in intense data processing, which is supported by: Servers performing complex computations Storage systems managing large amounts of data Cooling systems ensuring operational stability by preventing equipment from overheating All of this requires substantial energy. It is estimated that data centers use ~1-1.5% of the world's electricity, with data center energy consumption expected to rise as AI grows. AI applications, such as ChatGPT, must provide instant responses to users, meaning they must continuously consume power, even when idle. As AI models become more complex, their energy needs increase quickly. The computing power for AI doubles about every 100 days, showing just how fast these demands are escalating. State of generative AI: CIO survey Can generative AI transform your business? Discover what top CIOs reveal about the true potential of this technology. [DOWNLOAD REPORT](#) How can small modular reactors meet AI's increasing energy demands? SMRs provide a stable 24/7 power source, ideal for the continuous demands of AI data centers. SMRs have capacities ranging from 20 to 300 megawatts, meeting energy needs without large infrastructure, as in the case of traditional nuclear plants. Independent of power grids Small modular nuclear reactors operate independently of centralized power grids, ensuring resilience for AI-critical functions. This self-sufficiency reduces risks from outages or grid instability, allowing continuous operations. Such features are essential for the uninterrupted processing capabilities of AI technologies. Low carbon footprint SMRs present a low-carbon alternative to fossil fuels, aiding tech companies in achieving sustainability objectives.

2. Repurposing Coal

Abdussami 24 [Muhammad R. Abdussami, M.A. in Nuclear Engineering from Ontario Tech University & PhD from University of Michigan, June 2024, Investigation of potential sites for coal-to-nuclear energy transitions in the United States, Energy Reports, <https://www.sciencedirect.com/science/article/pii/S2352484724002993>, Willie T.]

1.2. Literature review

The U.S. government has undertaken various initiatives to assess the potential for coal-to-nuclear (C2N) transitions at coal sites across the country. Hansen et al. drafted an extensive report for the U.S. Department of Energy (DOE) that examined key factors influencing viable transitions for a hypothetical coal plant, considered the techno-economic aspects of C2N conversions, and evaluated the potential effects on local communities during this transition (Hansen et al., 2022). Similarly, Griffith et al. investigated different nuclear reactor technologies and provided valuable insights into the considerations for siting and replacing coal plants with nuclear alternatives (Griffith, 2021). A few technical studies have also been carried out in the field of C2N transitions. One investigation ("Gone with the Steam How new nuclear, 2021) discovered that repurposing coal plants with advanced reactors could offer

economic advantages and benefits for host communities compared to renewable energy generation. A technical report published by NuScale SMR technology highlighted the capability of NuScale SMR technology to repurpose retired coal plants while ensuring the economic stability of communities and workers ("An Ideal Solution for Repurposing U.S., 2021). Bartela et al. conducted a case study on a 460 MWe supercritical coal-fired plant in Poland, demonstrating the techno-economic benefits of replacing it with a nuclear reactor incorporating thermal energy storage (Bartela et al., 2022), (Bartela et al., 2021). Furthermore, Lukowicz et al. performed a techno-economic analysis on the same Polish coal plant, proposing the replacement of the plant's steam cycle with a small-scale modular Pressurized Water Reactor (PWR) (Lukowicz et al., 2023). Simonian et al. evaluate the potential of C2N transition at the Limestone coal plant in Texas, comparing small modular, high-temperature gas-cooled, and molten salt nuclear reactor technologies. Each technology's pros and cons are weighed against cost, risk, and C2N integration complexity. The study concludes no one-size-fits-all solution exists for C2N transitions, and specific nuclear designs and transition schemes must be carefully considered for each project based on technical specifications and feasibility (Simonian and Kimber, 2023). Notably, although these studies focused on specific candidate coal plants, comprehensive siting analyses for C2N transitions were not addressed.

The potential for advanced nuclear reactors to replace coal plants has been discussed in ("Coal-to-Nuclear Transitions, 2024), emphasizing their compatibility with variable renewable technologies and their capability to provide both electricity and process heat. The document ("Coal-to-Nuclear Transitions, 2024) examines economic impacts, job creation, and revenue benefits in host communities, noting **significant increases in employment and income following a coal-to-nuclear transition.** It discusses workforce requirements, educational needs, and training for transitioning workers, outlining the overlap and distinct roles between coal and nuclear plants. Policy and funding aspects, including tax incentives and loans, are also addressed, with a focus on achieving net-zero emissions targets by 2050 and supporting disadvantaged communities. The document emphasizes the critical role of utilities in managing transitions and presents a comprehensive outlook on infrastructure reuse and community engagement strategies for successful coal-to-nuclear conversions. In another paper, the advantages of repurposing existing site infrastructure, including transmission infrastructure, environmental permits, and water usage rights, have been examined. **Repowering coal plant sites with nuclear power offers clean, reliable, and dispatchable energy,** addressing the twin challenges of decommissioning and transitioning to **low-carbon energy sources.** The paper guides utilities through the key considerations and steps involved in evaluating and repurposing coal plant sites for advanced nuclear generation, focusing on the potential to retain jobs, tax bases, and community support.

In contrast to the technoeconomic analyses described above, the siting of advanced nuclear reactors within operating or retired CPPs has received relatively little attention in the literature. Belles et al. conducted an analysis using the Oak Ridge Siting Analysis for Power Generation Expansion (OR-SAGE) tool to evaluate the suitability of 13 coal power plants in the Tennessee Valley Authority (TVA) service territory for the deployment of advanced nuclear reactors (Belles et al., 2013). A similar approach was adopted in another study (Belles et al., 2021), where OR-SAGE was utilized to assess the retrofitting of advanced nuclear reactors in existing or retired coal plants. Furthermore, Omitaomu et al. employed the OR-SAGE tool to investigate the siting of advanced nuclear reactors across the contiguous United States (Omitaomu et al., 2022). In a separate study, Toth et al. employed the Advanced Nuclear Site Locator (ANSL) tool to evaluate 304 coal sites in the U.S., identifying **79 potentially feasible sites for coal-to-nuclear transitions** (Toth et al., 2021). However, they reported that state-level policies could pose challenges to the demonstration of advanced nuclear reactors. Therefore, a comprehensive assessment of all coal plants in the United States, encompassing operational and retired facilities, is necessary to gain an understanding of the most suitable coal sites for transitioning to nuclear power. While the existing literature provides some valuable insights into the siting potential of advanced nuclear reactors in coal plants, the number of studies on this subject remains limited.

1.3. Contribution

This paper aims to assess the feasibility of converting each operational coal site to nuclear power using a tool called Siting Tool for Advanced Nuclear Development (STAND). The studied coal plants are classified into two different groups (Group-01 and Group-02) based on their capacity. Since advanced nuclear reactors are divided into various classes, such as micro-reactors, medium-scale reactors, and Small Modular Reactors (SMRs), it is necessary to categorize coal plants accordingly to match their capacity for a smooth transition to nuclear power. Categorization will also help in presenting the research findings and data clearly, considering the substantial amount of data involved in the analysis. To conduct this analysis, our first step was to gather information on all operational coal sites in the U.S. until January 2023. **The operational coal sites are the focus of this study to take advantage of the existing Balance of Plant (BOP) equipment, such as transmission lines and power system protection components, which can reduce construction time and costs.** Analyzing operational coal plants will also guide policymakers, state-level governments, and energy modelers in determining the prioritization of coal plant retirements. Furthermore, we limit our study to operational coal sites in the U.S. as many retired coal sites lack the necessary technical infrastructure for an attractive coal-to-nuclear transition. Next, we classify all operational coal sites into two clusters based on their nameplate capacity. The CPPs located in non-contiguous states (e.g., Alaska and Hawaii) are not considered due to the lack of sufficient

data in STAND. Each cluster is then individually simulated in STAND using selected attribute values, as mentioned in Section 2, specifically in Table 1, Table 2, Table 3. Section 3 discusses the clustering of CPPs. Section 4 provides additional information about the STAND tool. Section 5 presents the results of the study, while Section 6 concludes the study with discussion. This paper presents a comprehensive approach for utilizing STAND in evaluating the feasibility of transitioning from coal to nuclear energy across the U.S. The detailed results and investigation will provide a clear idea on which factors one should consider for a particular region/area to C2N transitions.

Without quick action, power shortages will kill the AI race

Li 2025(FENGRONG LI, CFA, CIRA Managing Director Power, Renewables & Energy Transition (PRET) FTI Consulting, 27 February 2025, "The Powerful Duo of Nuclear and Data Centers", FTI, <https://www.fticonsulting.com/insights/articles/powerful-duo-nuclear-data-centers>, DOA: 3/7/2025)ET

Acute power shortages and mounting resource adequacy challenges have emerged as existential threats to the AI race. Hyperscale and colocation data centers — among the most energy- intensive digital infrastructures — **depend on reliable, 24/7 electricity to sustain AI workloads and cloud computing.** **However, intermittent, non-dispatchable generation resources dominate the interconnection queues; power constraints stall data center deployment. Nuclear power, with its carbon-free, high-energy output, presents a compelling solution to alleviate the bottleneck.** Large tech players and the nuclear industry have forged strategic alliances to **move new nuclear projects forward. These partnerships represent a crucial down payment on building sustainable energy infrastructures capable of supporting AI growth.** Experts at FTI Consulting have evaluated the collaboration models between these two sectors, including co-location strategies, which have gained momentum despite encountering pushbacks from market participants and regulatory bodies.

Domestic development is necessary for the US to beat China

Allison and Schmidt 20 (Graham Allison is the Douglas Dillon Professor of Government at Harvard University where he has taught for five decades., Eric Schmidt, "Is China Beating the U.S. to AI Supremacy?", Belfer Center, <https://www.belfercenter.org/publication/china-beating-us-ai-supremacy>, DOA 4/2/23) RK

Combining decades of experience advancing frontier technologies, on the one hand, and analyzing national security decisionmaking, on the other, we have been collaborating over the past year in an effort to understand the national security implications of China's great leap forward in artificial intelligence (AI). Our purpose in this essay is to **sound an alarm over China's rapid progress and the current prospect of it overtaking the United States in applying AI in the decade ahead;** to explain why **AI is for the autocracy led by the Chinese Communist Party** (hereafter, the "Party") **an existential priority**; to identify key unanswered questions about the dangers of an unconstrained AI arms race between the two digital superpowers; and to point to the reasons why we believe that **this is a race the United States can and must win**. We begin with four key points. First, most Americans believe that U.S. leadership in advanced technologies is so entrenched that it is unassailable. Likewise, many in the American national security community insist that in the AI arena China can never be more than a "near-peer competitor." Both are wrong. In fact, **China stands today as a full-spectrum peer competitor of the United States in commercial and national security applications of AI. Beijing is not just trying to master AI—it is succeeding. Because AI will have as transformative an impact on commerce and national security over the next two decades as semiconductors,** computers and the web have had over the past quarter century, **this should be recognized as a matter of grave national concern.**^{1,2,3} Second, China's zeal to master AI goes far beyond its recognition that this suite of technologies promises to be the biggest driver of economic advances in the next quarter century. **For the Party, AI is mission critical. The command**

of 1.4 billion citizens by a Party-controlled authoritarian government is a herculean challenge. Since the fall of the Soviet Union, Americans have been confident that authoritarian governments are doomed to fail—eventually. But AI offers a realistic possibility of upending this proposition. **AI could give the Party** not just an escape hatch from the “end of history,”⁴ but **a claim to advance a model of governance—a national operating system—superior to today’s dysfunctional democracies.** As one former Democratic presidential candidate put it: **“China is using technology to perfect dictatorship.”**⁵ **It’s a value proposition that resonates with many leaders around the world.** As former Google ceo Eric Schmidt has argued: **“if the Soviet Union had been able to leverage the kind of sophisticated data observation, collection and analytics employed by the leaders of Amazon today, it might well have won the Cold War.”** Third, while we share the general enthusiasm about AI’s potential to make huge improvements in human wellbeing, the development of machines with intelligence vastly superior to humans will pose special, perhaps even unique risks. In 1946, Albert Einstein warned, “the unleashed power of the atom has changed everything save our modes of thinking, and thus we drift towards unparalleled catastrophe.” We believe the same could be said of AI. Henry Kissinger has identified these risks in what we call “Kissinger’s Specter.” In his words, **AI threatens an unpredictable revolution in our consciousness and our thinking, and an “inevitable evolution in our understanding of truth and reality.”**⁶ In response to Einstein’s insight, the technologists and strategists who had built and used the bomb to end World War II joined forces to find ways to prevent a nuclear World War III. Meeting the challenges posed by AI will require nothing less. Fourth, **China’s advantages in size, data collection and national determination have allowed it over the past decade to close the gap with American leaders of this industry. It is currently on a trajectory to overtake the United States in the decade ahead. Nonetheless, if the United States will awake to the challenge and mobilize a national effort, we believe that it can develop and execute a winning strategy.** For many readers, AI is just the latest bright, shiny object on the technology horizon. A brief explainer to provide some further context may be helpful. **AI encompasses big data, machine learning and multiple related technologies that allow machines to act in ways humans describe as “intelligent” when we do the same thing.**⁷ For example, consider gps navigation app Waze locating the best route through heavy traffic; Amazon’s eerily relevant product suggestions; or the programmed machines that now regularly defeat world masters in chess. Today’s leading information technology companies—including the faangs (Facebook, Amazon, Apple, Netflix and Google) and bats (Baidu, Alibaba and Tencent)—are betting their r&d budgets on the AI revolution. As Amazon’s Jeff Bezos said this year, “We’re at the beginning of a golden age of AI.”⁸ China’s AI Surge Though still in their infancy, **AI technologies will be drivers of future economic growth and national security. From facial recognition and fintech to drones and 5g, China is not just catching up. In many cases, it has already overtaken the United States to become the world’s undisputed No. 1.** In some arenas, because of constitutional constraints and different values, the United States willfully forfeits the race. In others, China is simply more determined to win. China’s AI surge is so recent that anyone not watching closely has likely missed it. As late as 2015, when assessing its international competition, American industry leaders—Google, Microsoft, Facebook and Amazon—saw Chinese companies in their rearview mirrors alongside German or French firms in the third tier. But this changed four years ago—in 2016—when leading AI application company DeepMind fielded a machine that defeated world champion Lee Sedol in the world’s most complex board game, Go.⁹ Even after several American companies’ machines had bested the chess masters of the universe¹⁰, most Chinese remained confident that machines could never beat Go champions, since Go is ten thousand times more complex than chess. Thus, DeepMind’s decisive victory became for China a “Sputnik moment”¹¹—a jolt as dramatic as the Soviet Union’s launch of the first satellite into space that sparked America’s whole-of nation surge in math and science, nasa’s creation and the original “moon shot.” Kai-Fu Lee’s book *AI Superpowers* offers an insightful summary of China’s engagement in the field. It began with President Xi Jinping’s personal reaction to the defeat of the world’s Go champion. Declaring that this was a technology in which China had to lead, he set specific targets for 2020 and 2025 that put China on a path to dominance over AI technology and related applications by 2030.¹² Recognizing that this would have to be led by entrepreneurial companies rather than agencies of government, he designated five companies to become China’s national champions: Baidu, Alibaba, Tencent, iFlytek and SenseTime.¹³ Twelve months after Xi’s directive, investments in Chinese AI startups had topped investments in American AI startups.¹⁴ By 2018, China filed 2.5 times more patents in AI technologies than the United States.¹⁵ And this year China is graduating three times as many computer scientists as the United States. In contrast to nuclear weapons—where governments led in discovery, development and deployment—**AI and related technologies have been created and are being advanced by private firms and university researchers. The military establishments in Washington and Beijing are essentially playing catch-up, adopting and adapting private-sector products.** Where do these two competitors stand in the AI race today? Consider leading indicators under six key

headings: product market tests, financial market tests, research publications and patents, results in international competitions, talent and national operating environments. Consumers' choices of products in markets speak for themselves. In fintech, China stands alone. Tencent's WeChat Pay has nine hundred million Chinese users,¹⁶ while Apple Pay only has 22 million in the United States.¹⁷ And when it comes to capability, **WeChat** Pay can do much more than Apple Pay. Chinese consumers use their app to buy coffee at Starbucks and new products from Alibaba, pay bills, transfer money, take out loans, make investments, donate to charity and manage their bank accounts. In doing so, they **generate a treasure trove of granular data about individual consumer behavior that AI systems use to make better assessments of individuals'** credit-worthiness, interest in products, capacity to pay for them and other behavior. In mobile payments, Chinese spend \$50 for every dollar Americans spend, in total, \$19 trillion in 2018.¹⁸ U.S. mobile payments have yet to reach \$1 trillion. Credit cards are as old-fashioned to Chinese millennials as handwritten checks are to their American counterparts. Mark Zuckerberg has noticed: Facebook's major moves last year into digital payments,¹⁹ including the recent introduction of Facebook Pay, are copying Tencent, rather than the other way around.

Losing the AI race emboldens China Kroenig 21

(Dr. Matthew Kroenig is a professor of government and foreign service at Georgetown University and the director of the Scowcroft Strategy Initiative at the Atlantic Council. His most recent book is *The Return of Great Power Rivalry: Democracy versus Autocracy from the Ancient World to the US and China* (2020), Winter 2021, "Will Emerging Technology Cause Nuclear War?" *Strategic Studies Quarterly*, <https://www.jstor.org/stable/pdf/48638052.pdf> DOA: 3/7/23) LLO

How will states use such a newfound advantage? Technology rarely fundamentally changes the nature or objectives of states. More often, states use technology to advance preexisting geopolitical aims. Moreover, enhanced power can result in greater ambition. **Given the geopolitical landscape of the international system will behave differently with new military technologies than will revisionist powers, such as Russia and China. The spread of new technology to the United States and its Allies and partners would likely serve, on balance, to reinforce the existing sources of stability in the prevailing international system. At the end of the Cold War, the United States and its Allies and partners achieved a technological military advantage over its great power rivals, with the US using its unipolar position to deepen and expand a rules-based system.** They also employed their military dominance to counter perceived threats from rogue states and terrorist networks. **The United States, its Allies, and partners did not, however, engage in military aggression against great power, nuclear-armed rivals or their allies. In the future, these status quo powers are apt to use military advantages to reinforce their position in the international system and to deter attacks against Allies and partners in Europe and the Indo-Pacific.** These states might also employ military power to deal with threats posed by terrorist networks or by regional revisionist powers such as Iran and North Korea. **But it is extremely difficult to imagine scenarios in which Washington or its Allies or partners would use newfound military advantages provided by emerging technology to conduct an armed attack against Russia or China.** Similarly, **Moscow and Beijing would likely use any newfound military strength to advance their preexisting geopolitical aims. Given their very different positions in the international system, however, these states are likely to employ new military technologies in ways that are destabilizing. These states have made clear their dissatisfaction with the existing international system and their desire to revise it. Both countries have ongoing border disputes with multiple neighboring countries.** If Moscow developed new military technologies and operational concepts that shifted the balance of power in its favor, it would likely use this advantage to pursue revisionist aims. If Moscow acquired a newfound ability to more easily invade and occupy territory in Eastern Europe, for example (or if Putin believed Russia had such a capability), it is more likely Russia would be tempted to engage in aggression.

Likewise, if China acquired an enhanced ability through new technology to invade and occupy Taiwan or contested islands in the East or South China Seas, Beijing's leaders might also find this opportunity tempting. If new technology enhances either power's anti-access, area-denial network, then its leaders may be more confident in their ability to achieve a fait accompli attack against a neighbor and then block a US-led liberation. These are precisely the types of shifts in the balance of power that can lead to war. As mentioned previously, the predominant scholarly theory on the causes of war—the bargaining

model—maintains that imperfect information on the balance of power and the balance of resolve and credible commitment problems result in international conflict.⁵² New technology can exacerbate these causal mechanisms by increasing

uncertainty about, or causing rapid shifts in, the balance of power. Indeed as noted above, new military technology and the development of new operational concepts have shifted the balance of power and resulted in military conflict throughout history. Some may argue emerging military technology is more likely to result in a new tech arms race than in conflict. This is possible. But Moscow and Beijing may come to believe (correctly or not) that new technology provides them a usable military advantage over the United States and its Allies and partners. In so doing, they may underestimate Washington. If Moscow or Beijing attacked a vulnerable US Ally or partner in their near abroad, therefore, there would be a risk of major war with the potential for nuclear escalation.

The United States has formal treaty commitments with several frontline states as well as an ambiguous defense obligation to Taiwan. If Russia or China were to attack these states, it is likely, or at least possible, that the United States would come to the defense of the victims. While many question the wisdom or credibility of America's global commitments, it would be difficult for the United States to simply back down. Abandoning a treaty ally could cause fears that America's global commitments would unravel. Any US president, therefore, would feel great pressure to come to an Ally's defense and expel Russian or Chinese forces. Once the United States and Russia or China are at war, there would be a risk of nuclear escalation. As noted previously, experts assess the greatest risk of nuclear war today does not come from a

bolt-out-of-the-blue strike but from nuclear escalation in a regional, conventional conflict.⁵³ Russian leaders may believe it is in their interest to use nuclear weapons early in a conflict with the United States and NATO.⁵⁴ Russia possesses a large and diverse arsenal, including thousands of nonstrategic nuclear weapons, to support this nuclear strategy. In the 2018 Nuclear Posture Review, Washington indicates it could retaliate against any Russian nuclear "de-escalation"

strikes with limited nuclear strikes of its own using low-yield nuclear weapons.⁵⁵ The purpose of US strategy is to deter Russian strikes. If deterrence fails, however, there is a clear pathway to nuclear war between the United States and Russia. As Henry Kissinger pointed out decades ago, there is no guarantee that, once begun, a limited nuclear war stays limited.⁵⁶ There are similar risks of nuclear escalation in the event of a US-China conflict. China has traditionally possessed a relaxed nuclear posture with a small

"lean and effective" deterrent and a formal "no first use" policy. But China is relying more on its strategic forces. It is projected to double—if not triple or quadruple—the size of its nuclear arsenal in the coming decade.⁵⁷ Chinese experts have acknowledged there is a narrow range of contingencies in which China might use nuclear weapons first.⁵⁸ As in the case of Russia, the US Nuclear Posture Review recognizes the possibility of limited Chinese nuclear attacks and also holds out the potential of a limited US reprisal with low-yield nuclear weapons as a deterrent.⁵⁹ If the nuclear threshold is breached in a conflict between the United States and China, the risk of nuclear exchange is real. In short, if a coming revolution in military affairs provides a real or perceived battlefield advantage for Russia or China, such a development raises the likelihood of armed aggression against US regional allies, major power war, and an increased risk of nuclear escalation.

Extinction!

Sarg 15 [Dr. Stoyan Sarg, 10-9-2015, Director of the Physics Research Department at the World Institute for Scientific Exploration, PhD in Physics, "The Unknown Danger of Nuclear Apocalypse," Foreign Policy Journal,

<https://www.foreignpolicyjournal.com/2015/10/09/the-unknown-danger-of-nuclear-apocalypse/>, accessed: 11-5-2023] // sid

With the new NATO plan for installation of nuclear tactical weapons in Europe, nuclear missiles may reach Moscow in only 6 minutes, and the opposite case is also possible in the same time. The question is: how can we be sure that this will not be triggered by a human error or computer malfunction. An adequate reaction dictated by the dilemma "to be or not to be" and the concept of preventive nuclear strike may lead to a nuclear consequence that is difficult to stop. At the present level of distributed controlled systems and military global navigations, this will lead to unstoppable global nuclear war. However, there is something not predicted, of which the military strategists, politicians and powerful forces are not aware. Probably, it will not be a nuclear winter that they hope to survive in their underground facilities. The most probable consequence will be a partial loss of the Earth's atmosphere as a result of one or many powerful simultaneous tornadoes caused by the nuclear explosions. In a tornado, a powerful antigravitational effect takes place. The official science does not have an adequate explanation for this feature due to an incorrect concept about space. The antigravitational effect is not a result of the circling air. It is a specific physical effect in the aether space that is dismissed in physics as it is currently taught. Therefore, the effective height of this effect is not limited to the height of the atmosphere. Then in the case of many simultaneous powerful tornadoes, an effect of suction of the earth atmosphere into space might take place. Such events are observed on the Sun and the present physical science does not have an explanation for them. The antigravitational effect is accompanied by specific electric and magnetic fields with a twisted shape. This is observed in tornado events on the Sun. Some effects in the upper Earth atmosphere known as sprites have a similar combination of electrical and magnetic fields but in a weaker form. They are also a mystery for contemporary physical science.

At the time of atmospheric nuclear tests, made in the last century, a number of induced tornadoes are observed near the nuclear mushroom as shown in Figure 1.

The strongest antigravitational effect, however, occurs in the central column of the formed nuclear mushroom. The analysis of underwater nuclear tests also indicates a strong antigravitational effect. It causes a rise of a vertical column of water. In the test shown in Figure 2, the vertical column contains millions tons of water. Thermonuclear bombs are multiple times more powerful. The largest thermonuclear bomb of the former Soviet Union tested in 1961 is 50 megatons. It is 3,300 times more powerful than the bomb dropped by USA on Hiroshima at the second world war and may kill millions.

It is known that Mars once had liquid water and consequently an atmosphere that has mysteriously disappeared. If the scenario described above takes place, the Earth will become a dead planet like Mars. The powerful politicians, military adventurers and their financial supporters must be aware that even the most secured underground facility will not save them if a global nuclear conflict is triggered. Their disgraced end will be more miserable than the deaths of the billions of innocent human beings, including the animal world.

Rebuttal

No cards read on terror

A2 Renewable Tradeoff

1. The only relevant empiric in this round - the US - finds nuclear and renewables work together, there has been no tradeoff.

Nuclear Innovation Alliance, 10-07-2020, "We Need Both Nuclear and Renewables to Protect the Climate", Nuclear Innovation Alliance,
<https://www.nuclearinnovationalliance.org/we-need-both-nuclear-and-renewables-protect-climate> // Lunde

A review of country-level data further supports the importance of nuclear power in decarbonization. The number one producer of nuclear power in the world is the United States, where existing nuclear power plants still provide more than half of carbon-free clean electricity. Contrary to the study's conclusion that nuclear and renewable crowd each other out, the US is also emerging as a strong leader in renewable energy, with solar and wind growing rapidly. Policies that value nuclear and renewable energy can help both sectors grow and reduce US emissions further. China, the largest producer of solar panels, is also aggressively pursuing nuclear power and is on track to become the second largest producer of nuclear energy. In the European Union, the countries with the lowest power sector emissions are countries that embrace nuclear power.

At the U.S. state level, nuclear and renewable energy are working together to decarbonize electric grids, as seen in the chart below. The top 10 nuclear producing states have an average carbon intensity ~30% lower than the national average. More broadly, states with some nuclear generation have an emissions intensity 24% lower than states without it.

Prefer the US empirics it's specific to aff investment and finds nuclear and renewable can work together

2. Renewables rely on backup power - even under the aggressive Green New Deal they can't solve the crisis.

Benjamin Zycher, 10-10-2019, "The Trouble with 'renewable' Energy", American Enterprise Institute - AEI, <https://www.aei.org/articles/the-trouble-with-renewable-energy/> // Lunde

The backup conventional units must be “cycled” (that is, ramped) up and down depending on whether the renewable units are producing power. That cycling reduces the operating efficiency of the backup units — more gas or coal must be burned for a given amount of backup power — and under a broad range of conditions increases net emissions of conventional pollutants and reduces greenhouse-gas emissions by far less than advertised. And to what end? The electricity component of the GND, under highly favorable assumptions, would reduce temperatures by the year 2100 by about 0.173 degrees Celsius, barely distinguishable from zero, from where such temperatures would be otherwise.

Prefer us here we analyze the most aggressive timetable for renewables that has ever existed can't even solve for climate change because its not base power. They just say Trump didn't kill the movement not that renewables can actually solve for the brink at current pace.

A2 Cyber

No Effective Attack on Nuclear Plants in Human History WNA 25

World Nuclear Association, 02-12-2025, "Security of Nuclear Facilities and Material," World Nuclear Association,

<https://world-nuclear.org/information-library/safety-and-security/security/security-of-nuclear-facilities-and-material>, Mehran

Security of Nuclear Facilities and Material Updated Wednesday, 12 February 2025 Security at nuclear facilities is the responsibility of national governments. **To date, no cyber-attack on a nuclear reactor's information and control system has compromised safety.** The first time an operating civil nuclear power plant was attacked by an armed group was during Russia's military action in Ukraine in early 2022. Nuclear security relates to the prevention and detection of, and response to, theft, sabotage, unauthorized access and illegal transfer or other malicious acts involving nuclear material and other radioactive substances and their associated facilities. As a function, nuclear security is distinct from the safeguards to prevent the proliferation of atomic weapons technology. Ultimate responsibility for the security of nuclear facilities and the fuel cycle rests with national governments, which should define the roles and responsibilities of the regulatory and other competent authorities, as well as operators.¹ Although safety and security are treated separately, if a facility or a radioactive source is not secure, it could pose a potential hazard and, thus, is not safe.

Since the early 2000s, there has been a shift of attention from ensuring that nuclear materials are not diverted from peaceful uses, **towards protecting plants from armed assault and cyber-attacks.** Threat from terrorism Following the '9/11' attacks in New York and Washington on 11 September 2001, governments revisited nuclear security and put more emphasis on terrorism. In 2002 the Group of Eight (G8) industrial countries expanded their cooperation to launch the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction to "prevent terrorists, or those that harbour them, from acquiring or developing nuclear, chemical, radiological and biological weapons; missiles; and related materials, equipment and technology."² This global partnership has grown and now has 31 members. Additionally, in 2004 the United Nations Security Council approved Resolution 15403 obliging every state to adopt and enforce laws to stop non-state actors from obtaining weapons of mass destruction, including nuclear weapons. The potential threat of nuclear terrorism also sparked another dimension to the debate within civil

society over the risks posed by nuclear technology. Several **non-governmental and academic organizations dedicated to** raising the political profile of such threats were founded or began programmes **examining the security of** nuclear materials at power **plants**, hospitals and research institutions. The Nuclear Threat Initiative (NTI), for example, was founded in early 2001 to **protect our lives**, livelihoods, environment and quality of life now and for future generations from the growing risk of catastrophic attacks **from** weapons of mass destruction and **disruption**.³ The Fissile Materials Working Group (FMWG) was set up in 2009 as an international coalition of NGOs to advocate improved security of fissile materials. The NTI and the FMWG were instrumental in shaping the agenda of four Nuclear Security Summits, which were held between 2010 and 2016 on the initiative of US President Barack Obama (see section below on Nuclear Security Summits). The 9/11 attacks prompted the IAEA's General Conference to review its programmes relevant to preventing acts of terrorism involving radioactive material. The first Nuclear Security Plan (for 2002-2005) was prepared and a series of publications on nuclear security was developed, along similar lines to the existing nuclear safety guidelines. In 2012, the Nuclear Security Guidance Committee was established to engage with member state governments in preparing nuclear security guidance. The threat from

terrorism influenced the definition of security adopted by the IAEA, which argues: Vulnerabilities at nuclear facilities can make them susceptible to malicious acts and create opportunities for terrorists or criminal groups. The objective of physical protection is, therefore, to prevent access to, or control over, the nuclear facility or nuclear material through the use of protective measures, technical means and/or the use of guards and response forces.⁴ Protective measures include physical barriers, (e.g. walls, fences and gates), controlled and restricted access to identified locations within the facility, and categories of identification badging for personnel. A number of technical controls also exist, such as radiation detection portals, surveillance cameras, X-ray scanners for detecting hidden weapons or explosives, and interior and exterior intrusion detection sensors. The numbers and capabilities of security personnel must also be appropriate to the level of threat, as assessed by the government. **The nuclear industry has largely been free from violent attacks. A number of incidents in the 1970s and early 1980s were directed at nuclear plants that were under construction, as a way of trying to halt the construction of the reactors.**

Examples include: Leftist guerrillas briefly occupied the Atucha construction site in Argentina in 1973. The Basque separatist group ETA set off bombs and fired shots at the Lemóniz nuclear power plant in Spain while it was under construction on three occasions between 1977 and 1979, killing three workers, and also assassinated the project's chief engineer José María Ryan Estrada and his replacement Ángel Pascual Mújica in 1981 and 1982 respectively. Four small bombs planted by an anti-apartheid sympathizer working at the Koeberg nuclear power plant in South Africa during its construction were detonated in 1982, without causing loss of life or injury. Rocket-propelled grenades were fired by associates of the Red Army Faction at the Superphénix fast reactor in France in 1982, while it was under construction, causing minor damage. Chemicals have been used in terrorist attacks but so far there has not been a case where radiological material has been employed. Threat from military action The Additional

Protocol of 1979 to the **Geneva Conventions contains in Article 56 a provision stating that nuclear power plants "shall not be made the object of attack even where these objects are military objectives**, if such an attack may cause the release of dangerous forces and consequent severe losses among the civilian population." Before the 2020s, **no operating civil nuclear power plant had been the object of a military attack**.^a In July 2020, tensions between Azerbaijan and Armenia led to an Azerbaijani official threatening a missile strike against Armenia's Metsamor plant. In March 2022, the Zaporozhe nuclear power plant in Ukraine came under attack, and subsequent control, by the Russian military. While none of the plant's six units appeared to be directly targeted, a projectile hit a training centre located within the site. The State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) said a resulting fire had not affected "essential" equipment.