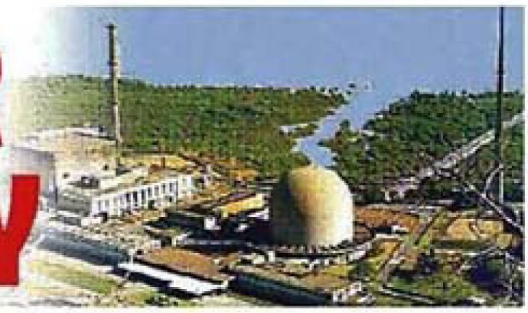
NUCLEAR SECURITY



A FORTNIGHTLY NEWSLETTER ON NUCLEAR DEFENCE, ENERGY AND PROLIFERATION FROM CENTRE FOR AIR POWER STUDIES

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OPINION – Anil Kakodkar

Fuel for a Green Viksit Bharat

India's aspiration to be "viksit" by the centenary year of its independence, while adhering to the net zero carbon emissions target for 2070, needs a strategy for sustained per capita energy use. The strategy also needs to focus on achieving a Human Development Index of 0.95, which is characteristic of advanced countries, and provide clean energy for this purpose. This corresponds to around 28,000 TWh of total energy annually. The available clean energy sources to address this need are renewable energy, large hydro power and nuclear. Among them, nuclear energy's contribution would need to be at least around 20,000 TWh annually since the other two together are unlikely to exceed 8,000 TWh. Today, India consumes around 9,800 TWh annually with around 96 per cent coming from fossil resources. Clean energy needs to increase 70 times and around 70 per cent of it needs to come from nuclear in 45 years.

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After Independence, Homi Bhabha had advocated a three-stage nuclear power programme aimed at long term energy security and autonomy for the country. We seem to be losing that focus. Surely, there are constraints and challenges, some of which are external. However, a sharper focus on our end goal, despite the strong foreign vendor-driven narratives that seem to be gaining currency of late, is something we cannot afford to lose sight of.

Any nuclear programme has to necessarily begin with uranium — the only natural source of fissionable material. While our uranium resources were modest to begin with, the emphasis on exploration has led to an increase in stocks. The ore grades, however, are very low. These reserves, despite the higher cost they entail, are a key source of energy security, especially in a situation when uranium imports are disrupted. Access to foreign uranium markets has enabled the first-stage nuclear programme to grow well beyond 10 GWe, a

threshold that was envisaged earlier. However, the second-stage programme of fast breeder reactors is yet to take off.

We must, however, celebrate our domestic PHWRs, the proven and competitive technology that meets global benchmarks. While the 100 GWe nuclear mission launched by the government would still leave us about twentyfold below the nuclear capacity required for a net zero "Viksit Bharat", realising it within the specified timeframe requires accelerated deployment. This, in turn, depends essentially on proven technologies — domestic PHWRs being the primary workhorse, supplemented by proven large LWRs. We must also bring in multiple deployment agencies, beyond NPCIL and now NTPC. The PHWR technology must be seen as a common national good and made available to potential domestic agencies for accelerated deployment with a mentoring approach. Efforts to minimise the costs are necessary in the case of LWRs by following the Make in India approach.

We must, however, celebrate our domestic PHWRs, the proven and competitive technology that meets global benchmarks. While the 100 GWe nuclear mission launched by the government would still leave us about twentyfold below the nuclear capacity required for a net zero "Viksit Bharat", realising it within the specified timeframe requires accelerated deployment.

100 GWe capacity would need around 20,000 tons of uranium annually. This could be around 15 per cent of global uranium production. Given the constraints of geopolitics as well as potential demand-supply mismatch in a growing nuclear energy scenario, this may well become a major energy security challenge of a dimension that is more serious compared to oil and gas today. The three-stage programme, which involves recycling nuclear fuel, enables 60-70 times more energy from the same quantity of mined fuel. A quick shift from mined uranium to recycled uranium and plutonium in fast reactors has thus become an energy security imperative. In view of the delay in deploying FBRs, irradiating thorium, of which we have the largest reserves, in our PHWRs has become crucial. That we are now leveraging much greater quantities of uranium than envisaged earlier also enables large-scale introduction of thorium in our PHWRs. This would help us in preparing to address the energy security challenge by recycling thorium-based spent fuel in molten salt reactors (MSR) and advance the third stage despite delays in the second stage. While the plan to introduce thorium in fast reactors to lead us into the third stage should continue, this would enable a faster route to thorium MSRs. One could also link high-power GeV range proton accelerators with subcritical systems based on such configurations to facilitate capacity growth.

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SMRs, which are dominating the narrative today, would take at least two decades to mature before deployment at scale can begin. Not only is this inconsistent with the 2047 timeline, the uranium required will also be harder to access at that time. Instead, we would be better off devoting our R&D resources to developing thorium MSR-based SMRs as well as other technologies relevant to the second and third stage that would take us closer to our thorium goal.

High Assay Low Enriched Uranium (HALEU) and irradiation qualification of thorium fuel for high burn-up performance are prerequisites to introducing thorium in PHWRs. They also have several advantages with respect to economics, safety, waste management and proliferation resistance — the move would be attractive without any significant change in the reactor. HALEU is also

fast becoming the choice for many advanced power reactor systems just as it has become so for research reactors. This is an area for international cooperation benefiting not just India but also the emerging economy countries. ANEEL fuel, which is under development, aims to achieve just that. One should expect the 100 GWe nuclear mission to be a forerunner to the much larger nuclear energy deployment necessary for net zero Viksit Bharat and not reach a virtual dead end.

Source: https://indianexpress.com/article/opinion/columns/fuel-for-a-green-viksit-bharat-10061400/ , 12 June 2025.

OPINION – Henry Sokolski

Don't Let Iran Walk Free from the NPT

Early this morning, Iran's Supreme Leader, Ayatollah Ali Khamenei, rejected America's proposal to create a regional uranium enrichment plant and eventually eliminate Iranian nuclear fuel making. "The proposal that the Americans have presented," he insisted, "is 100% against [Tehran's] interests." Washington has long argued that Iranian uranium enrichment constitutes nuclear weaponization and would allow Iran to get a bomb at any time; Tehran, for its part, maintains it has a "right" to enrich. These positions leave little room for compromise. Either Washington permits Iran to make nuclear fuel, allowing for a deal, or it doesn't, and the talks fail.

Washington has long argued that Iranian uranium enrichment constitutes nuclear weaponization and would allow Iran to get a bomb at any time; Tehran, for its part, maintains it has a "right" to enrich. These positions leave little room for compromise. Either Washington permits Iran to make nuclear fuel, allowing for a deal, or it doesn't, and the talks fail.

Meanwhile, the United States, United Kingdom, and Germany are pushing the IAEA to report to the United Nations Security Council that Iran has violated its nuclear safeguard obligations. The agency will meet to consider this request on June 9. This may trigger more economic sanctions against Tehran. What happens next could endanger the last international legal barrier to nuclear proliferation — the NPT. Iran has threatened that if it is sanctioned for exercising its nuclear right to enrich, it will withdraw from the treaty. Washington now should prepare for this. Unfortunately, it hasn't — at the latest NPT Preparatory Review Conference in New York, US officials did not even bring the matter up.

That's a mistake. Based on history, withdrawing from the NPT is a direct path towards nuclear weapons. North Korea's NPT withdrawal two decades ago demonstrates why. In 1994, The IAEA found Pyongyang in violation of its nuclear safeguard obligations. Pyongyang responded by barring further IAEA inspection and initiating withdrawing from the NPT.

To stop the 90-day treaty withdrawal process, the United States cut Pyongyang a deal. Washington promised North Korea two light water power reactors if Pyongyang agreed to routine IAEA inspections. Pyongyang agreed and reactor construction began. North Korea, however, never resumed routine inspections. Instead, in 2003, Pyongyang withdrew from the NPT with impunity. Three years later, in 2006, it tested its first nuclear weapon. Only then did the United Nations impose sanctions. Fast forward 20 years. Iranian officials now warn that if Washington imposes additional nuclear sanctions on Tehran, Iran will withdraw from the NPT. Given this threat, some experts recommend dropping trade sanctions on Iran if it will stay in the NPT. Their assumption is Iran won't follow North Korea's

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It's unclear if the United States can prevent Iran from getting a bomb. Washington with its allies, however, can make any Iranian withdrawal from the NPT hurt. At the very least, Iran should not become an example for other would-be bomb makers — such as Saudi Arabia, Turkey, Egypt and South Korea — to emulate. Towards that end, the United States and like-minded nations should:

1. Propose automatic, country-neutral NPT withdrawal penalties at the UN and clarify penalties for non-weapons states if they withdraw from the NPT before coming into full compliance with their IAEA nuclear safeguards obligations. These penalties should include economic and nuclear supply sanctions. The resolution should also require that withdrawing states continue to adhere to routine IAEA inspection obligations until they are found in full compliance.

Affirm nuclear weaponization activities are violations of the NPT. Although the IAEA does not verify if states are engaged in such activities, the clear sense of the NPT is that it prohibits members from "manufactur[ing] or otherwise acquir[ing] nuclear weapons.

2. Declare NPT withdrawal by noncompliant states constitutes "a threat to international peace and security," triggering Chapter VII, Article 39 of the UN. Such a resolution should authorize the IAEA to conduct augmented inspections clarifying a state's nuclear status before it exits the treaty.

3. Affirm nuclear weaponization activities are violations of the NPT. Although the IAEA does not verify if states are engaged in such activities, the clear sense of the NPT is that it prohibits members from "manufactur[ing] or otherwise acquir[ing] nuclear weapons." Calling on the UN Security Council to authorize nuclear weapons state members of the NPT to inspect for such activities is essential.

The immediate aim of these measures is to deter Iran from withdrawal. However, this effort should be framed as a country-neutral initiative that addresses the gaps in the NPT and the IAEA's charter that proliferators could otherwise exploit. If, as is likely, China and Russia short circuit these UN measures, Washington should proceed with like-minded nations. A joint statement from these states announcing predefined penalties — trade restrictions, diplomatic isolation, financial sanctions — would deter other would-be bombmakers and put Iran in a penalty box.

The United States and like-minded states should act now. They should announce these penalties and propose a resolution before the UN Security Council. An additional venue for promoting these measures is the NPT Review Conference slated for next April. What's essential is to make these proposals now, otherwise, Tehran will be able to walk from the NPT with impunity.

Source: https://breakingdefense.com/2025/06/dont-let-iran-walk-free-from-the-npt/, 04 June 2025.

OPINION – Teoman Ertugrul Tulun

The Last Arms Control Treaty under Nuclear Threat

The daring drone attacks launched by Ukraine against various Russian air bases on June 1, 2025, just before the second face-to-face meeting between the two countries in Istanbul, should be carefully evaluated from multiple perspectives. As will be recalled, the first meeting between the two countries also took place in Istanbul in 2022.

Various media outlets report that the operation, called "Spider Web," was carried out by more than 100 drones against various air bases in Russia's remote regions of the Ukrainian border. The Russian Defense Ministry announced in a brief statement that the operation, which was described as a "terrorist attack," was carried out using FPV UAVs on military air bases in the Murmansk, Irkutsk, Ivanovo, Ryazan and Amur regions; that the attacks on the Ivanovo, Ryazan and Amur regions were repelled; that some aircraft caught fire as a result of the launch of FPV UAVs from the immediate vicinity of airports in the Murmansk and Irkutsk regions; that the fires were extinguished; that there were no casualties among

military and civilian personnel and that some of the participants in the attacks were detained.

The BBC reported, citing Ukrainian sources, that 41 strategic bombers were damaged and at least 13 destroyed. In other sources, it is stated that a total of 41 planes were destroyed, most of which were built in Soviet days and are now out of production, so they cannot be easily replaced anytime soon. In this context, it is stressed that the worst damage was done at the Belaya Long-Range Aviation base in Irkutsk Oblast, Siberia. It is claimed in the reports that destroyed planes include several Tu-95, Tu-160 and Tu-22M3 long-range strike bombers that can deliver Russian nuclear bombs to targets thousands of kilometers away, and the destruction of Tu-160s would severely degrade Russia's cruise missile strike capability and nuclear deterrent.

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START-3 Treaty: While some media sources praise Ukraine's successful operation, there are also criticisms about why such valuable Russian strategic bombers are not kept in closed hangars. Addressing these criticisms, Top War, an online military review published in Russia, points out the provisions of the New START-3 between Russia and the United States. It emphasizes that one of the key elements of the treaty is transparency, which mandates that strategic bombers must be parked in open areas so that their numbers and status can be verified through satellite reconnaissance or inspections. This rule aims to reduce insecurity risks and prevent unexpected escalations. Article X of the treaty stipulates that, "Each party undertakes ... not to use concealment measures that impede verification, by national technical means of verification, of compliance with the provisions of this Treaty."

The most crucial point to remember in this context is the importance of the New START-3 Treaty in terms of global security. It is a well-known fact that nearly all arms control regimes in Europe have unfortunately lost their importance, especially after the outbreak of the conflict in Ukraine in 2014, and that it is no longer possible to talk about the existence of credible conventional arms control regimes either in the OSCE region or on the Eurasian scale. In this context, the developments in the nuclear field are, to say the least, also worrisome.

It is worth noting that the U.S. officially withdrew from the INF Treaty on Aug. 2, 2019, and the Russian Federation also announced that the treaty had ended. It is known that nuclear weapon states of the Treaty on the NPT assert that deterrence continues to play a role in preserving regional and international security. Meanwhile, many non-nuclear weapon states of the NPT have expressed their concern about the new nuclear arms race and the adverse developments in the nuclear disarmament field.

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In such a dark environment, the New Strategic Arms Reduction Treaty is the last remaining bilateral arms control treaty between the U.S. and Russia. It legally limits the number of long-range nuclear weapons both countries can deploy. The treaty was negatively affected by the Russia-Ukraine war and U.S. support for Ukraine led President Vladimir Putin to suspend Russia's participation in New START in February 2023, although he pledged to continue abiding by the treaty's limits. The U.S. responded by ending Russia's ability to monitor U.S. nuclear sites, revoking inspectors' visas and denying clearance for Russian aircraft in U.S airspace. The U.S. State Department has declared

that Russia cannot be said to be in full compliance with the New START treaty. However, it did not undertake any major activities outside the treaty in 2024.

As mentioned in credible online sources, Russia suspended, but did not cancel, its participation in the START treaty after sanctions were imposed on it in 2022. Still, it has kept the door open to restarting and reimposing all the Cold War-era security agreements, should a cease-fire agreement be reached with Ukraine and its Western allies. While the mutual inspections of nuclear facilities were suspended in August 2022, Russia is still sticking to the provision that Russia keep its fleet of nuclear-enabled long-distance bombers visible to satellites by parking them out in the open on airfields, albeit very distant from the Ukrainian front line. New START is set to expire on Feb. 5, 2026. It is unclear what will happen after New START expires. The treaty's demise risks opening the door to new nuclear proliferation.

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Escalating the War: As we are going through a sensitive period in terms of nuclear arms control, it seems highly probable that Ukraine's destruction of Russian heavy bomber aircraft, as mentioned in the New START Treaty, thousands of kilometers away from the Russian-Ukrainian border, will have negative strategic consequences. It is impossible to make definitive predictions about how Russia will respond to this attack. However, this risky behavior will likely not go unanswered. The consequences of Ukraine's determined steps to escalate the war are of great concern not only to Ukraine itself but also to all of Europe, NATO, and most importantly to the NATO countries neighboring Ukraine.

U.K. announced a few days ago that it will build new nuclear-powered attack submarines, prepare its army for a potential war in Europe and become "a battle-ready, armor-clad nation." Recent developments give the impression that the drums are beating for a large-scale war.

It is also noteworthy that the U.K. announced a few days ago that it will build new nuclear-powered attack submarines, prepare its army for a potential war in Europe and become "a battle-ready, armor-clad nation." Recent developments give the impression that the drums are beating for a large-scale war. These developments, which come at a time when Türkiye is continuing its best efforts for peace with tremendous goodwill, do not seem to bode well. Despite all these negativities, it is becoming increasingly crucial for Türkiye to call on all parties to exercise common sense and to tirelessly continue its well-intentioned peace efforts.

Source: https://www.dailysabah.com/opinion/op-ed/the-last-arms-control-treaty-under-nuclear-threat, 06 June 2025.

OPINION – Andrei Mateev

In Kazakhstan's Nuclear Race, Financial Muscle will Decide the Winner

The most closely watched development in Kazakhstan this June is the decision over which foreign company will be awarded the contract to build the country's first nuclear power plant. According to earlier announcements, the Kazakh Atomic Energy Agency is expected to make its decision by the end of the month. Bidders from South Korea, France, Russia, and China remain in contention, although recent expert commentary suggests that earlier assumptions favoring Russia's Rosatom may no longer hold.

Competing Interests Beneath the Surface: In Kazakhstan, there appears to be an internal

struggle between two strategic camps with opposing visions for the project's future. Each faction has its own backers, deeply embedded in the country's nuclear ambitions. One group, primarily composed of financial officials and economic policymakers, is advocating for the least expensive option. Their preferred bidder is China's China National Nuclear Corporation (CNNC), which is offering the lowest project cost, backed by Chinese bank financing. This group is influenced not only by CNNC's competitive pricing but also by China's broader economic leverage over Kazakhstan.

The second group consists of nuclear professionals, scientists, engineers, and technicians, who prioritize reliability and operational familiarity. Their preference leans toward Rosatom, given Russia's historical involvement and established presence in Kazakhstan's nuclear sector. This technical camp is widely viewed as a de facto ally of the Kremlin, as Rosatom's participation would extend Moscow's long-term strategic influence in Central Asia. Given the 50-60-year operational lifespan of such reactors, this influence would be enduring. Though this tension remains speculative, patterns observed over the past decade suggest a real and ongoing tug-of-war.

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No Thermal Power, No Nuclear Power? At the end of May, media in Kazakhstan reported that Russia might not fulfill its commitments under a 2023 memorandum signed during President Vladimir Putin's visit to Astana. The agreement with President Kassym-Jomart Tokayev concerned the construction of three coal-fired thermal power plants (TPPs) in Kokshetau, Semey, and Ust-Kamenogorsk, with Russian energy giant Inter RAO designated as the turnkey builder. The total cost was estimated at $2.8 billion.

However, in April 2024, First Deputy Prime Minister Roman Sklyar acknowledged financial hurdles. While design and preliminary work continue, difficulties remain in subsidizing equipment interest rates. Sklyar noted that a change in investor may be considered, and the situation could be resolved within a month. Oil and gas expert Olzhas Baidildinov has speculated that the nuclear power plant project may be bundled with the thermal plants as a "social burden", a condition that CNNC might accept more readily than Rosatom. "If CNNC is chosen to build the nuclear power plant, the thermal plants could follow as part of the package," Baidildinov suggested via his Telegram channel. Sergey Agafonov, head of the Kazakhstan Association of Energy Supply Organizations, also sees the nuclear and thermal plant projects as interconnected, particularly with regard to financing.

Debunking the Price Myth: The technical community has responded swiftly to growing narratives about CNNC's supposedly unbeatable offer to construct the nuclear plant for $5.5 billion, a claim spread via Chinese sources. Nuclear physicist Sayabek Sakhiev, Director General of the Institute of Nuclear Physics, called these figures implausible. Citing global construction costs, he estimated a realistic price range of $10-15 billion for such a facility. He noted that even a Chinese-built plant in Pakistan, completed in 2013, cost $9.1 billion, equivalent to $12.5 billion today after adjusting for inflation. "Announcing that China can build 2.4 GW of nuclear capacity in Kazakhstan for $5.5 billion is simply untrue," Sakhiev emphasized.

A Decision Rooted in Financing Power: Ultimately, the decision may not hinge on technical reliability or long-term geopolitical considerations, but on which bidder can shoulder the heaviest financial burden. If Kazakhstan has indeed conditioned the

nuclear plant contract on the simultaneous construction of three coal-fired TPPs, a deeply unfashionable investment globally, then the financially stronger Chinese side is likely to emerge victorious. In the end, the race for Kazakhstan's nuclear future may be decided not by reactors, but by balance sheets.

Ultimately, the decision may not hinge on technical reliability or long-term geopolitical considerations, but on which bidder can shoulder the heaviest financial burden. If Kazakhstan has indeed conditioned the nuclear plant contract on the simultaneous construction of three coal-fired TPPs, a deeply unfashionable investment globally, then the financially stronger Chinese side is likely to emerge victorious. In the end, the race for Kazakhstan's nuclear future may be decided not by reactors, but by balance sheets.

Source: https://timesca.com/opinion-in-kazakhstans-nuclear-race-financial-muscle-will-decide-the-winner/, 06 June 2025.

OPINION – Saman Sofalgar

Iran's Unwavering Commitment to its Nuclear Rights

On the anniversary of the passing of Imam Khomeini, the Leader of the Islamic Revolution delivered a powerful and principled speech defending Iran's right to enrich uranium. He categorically rejected American demands to halt the enrichment process, stating that such demands contradict Iran's national aspirations and its enduring belief in the power of self-reliance. "The United States is in no position to dictate whether Iran should engage in enrichment or not," he declared firmly.

These remarks carry a deeper message. They reaffirm that Iran's nuclear program is more than a political issue—it is a strategic pillar of national development and independence. As the Leader noted, nuclear technology is not simply a tool for energy production; it is a "mother industry" that fuels advancements in medicine, agriculture, pharmaceuticals, aerospace, nanotechnology, and defense. Preserving this industry is essential for protecting Iran's scientific and technological future.

The Leader described uranium enrichment as the foundation of Iran's nuclear industry and emphasized that even a hundred nuclear power plants would be meaningless without the ability to produce nuclear fuel independently. He warned that the true objective of the United States is not nuclear non-proliferation, but the total dismantling of Iran's nuclear capabilities—an ambition Iran will never accept.

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In today's world, where global energy needs are rising and developed nations continue to expand their nuclear sectors, denying Iran access to peaceful nuclear technology is not only unjust but also a clear violation of international norms. Iran, as a committed signatory to the NPT, has consistently cooperated with the IAEA and has received repeated confirmations of the peaceful nature of its nuclear program. Yet, some Western powers—particularly the United States—remain fixated not on the threat of nuclear weapons, but on the emergence of an independent, scientifically advanced Iran that resists external domination.

The Leader rightly identified uranium enrichment as a symbol of strategic autonomy. Western pressure—whether economic, political, or media-driven—is designed to keep Iran's nuclear fuel cycle incomplete and dependent. However, a nation that

cannot produce its own reactor fuel is at the mercy of foreign suppliers, forced to purchase it at high prices and under politically motivated conditions. Such a dependency is fundamentally at odds with the principle of national sovereignty.

One of the most striking parts of the Leader's address was his direct challenge to the American approach to global diplomacy. "Why do you interfere with whether Iran enriches uranium? Who are you to decide?" he asked pointedly. This was not a rhetorical question, but a legitimate protest against the double standards and coercive tactics used by global powers. It is precisely this kind of arrogance, coupled with sanctions and broken promises, that has eroded Iranian trust in Western commitments such as the JCPOA.

Iran is no longer on the defensive. With decades of scientific investment, the dedication of its youth, and hard-earned diplomatic experience, the country is now capable of defining its own terms in any future negotiations. The nuclear achievements of the Islamic Republic are the result of tireless efforts, international resistance, the sacrifice of its scientists, and the steadfastness of its people.

Importantly, Iran is no longer on the defensive. With decades of scientific investment, the dedication of its youth, and hard-earned diplomatic experience, the country is now capable of defining its own terms in any future negotiations. The nuclear achievements of the Islamic Republic are the result of tireless efforts, international resistance, the sacrifice of its scientists, and the steadfastness of its people. Abandoning these accomplishments would not just mean giving up an advanced technology—it would represent a retreat in the face of external pressure and a betrayal of national pride.

In today's world, where knowledge and innovation define power, Iran's homegrown nuclear capability has elevated its status as a serious and respected actor in an emerging multipolar world. Many nations looking beyond a US-dominated unipolar system now view Iran's experience as a model of scientific resistance and balanced diplomacy. The Leader's message to the Iranian nation was also clear: the path to scientific progress and national independence must be pursued with unity, confidence, and determination. Support for scientists, protection of intellectual resources, stronger ties between academia and industry, and resilience in the face of foreign threats must remain national priorities.

Ultimately, the Leader's remarks were not just about defending a right—they were a call to continue a journey. A journey that began with resistance to oppression and continues today through an unwavering commitment to knowledge, dignity, and national progress. Iran, through reason and resistance, does not ask for permission to assert its rights, nor does it yield them. This is the resolute and unambiguous message the Iranian nation sends to the world.

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Source: https://en.mehrnews.com/news/232769/Iran-s-Unwavering-Commitment-to-Its-Nuclear-Rights, 07 June 2025.

OPINION – Lior Prosor

Atoms Over Oil: Trump's (Civilian) Nuclear Pivot and Israel's Strategic Role

When Americans and Israelis think of President Trump's nuclear legacy, their minds usually go straight to the Iran nuclear deal and his out of the box and stern approach to global diplomacy. But another "nuclear pivot"—quieter, more technical,

but also quite consequential—was announced two weeks ago: an ambitious push to revitalize civilian nuclear energy in the United States. It received little fanfare in Israel at the time but may prove to be one of the most important energy policy moves of the decade.

With this, Trump doubled down on his energy legacy with a sweeping proposal aimed at accelerating America's nuclear power industry. This wasn't a policy footnote—it's a strategic move that could redefine America's energy market. And as with most deep shifts in the U.S., the ripple effects are global. Trump's nuclear pivot isn't about short-term fixes or nostalgia for Cold War technology.

With this, Trump doubled down on his energy legacy with a sweeping proposal aimed at accelerating America's nuclear power industry. This wasn't a policy footnote—it's a strategic move that could redefine America's energy market. And as with most deep shifts in the U.S., the ripple effects are global. Trump's nuclear pivot isn't about short-term fixes or nostalgia for Cold War technology. It's about creating the backbone of a new economic era—one powered by cheap, scalable and emission-free electricity. At its core is a bold package of regulatory reforms and incentives that return civilian nuclear energy to center stage.

America is in a New Cold War: The backdrop to this reform is important. The United States is locked in a new "Cold War 2.0" with China—an arms race not just in weapons but in chips, AI, quantum computing, and industrial capacity. In this race, energy is the bottleneck. While China increased its electricity generation sixfold from 2000 to 2020, the U.S. saw less than double digit growth. At the same time, ballooning national debt constrains public investment. The only real way out of this bind? A massive leap in productivity—of the kind only possible through automation, AI, and advanced computing. And all of that requires a single, irreplaceable input: Electricity. Lots of it. Nuclear energy isn't just a low-emission option—it's the only scalable, always-on, zero-carbon solution that can support this technological leap at the national level.

Saudi Arabia and the UAE are investing billions in civilian nuclear programs. The Emirates have four operational reactors. Saudi Arabia has built an advanced research reactor and is actively exploring commercial options— a process we should all hope unfolds with Western partners at the table. And Israel? Despite being a global hub for innovation, Israel is sitting on the sidelines.

The Gulf Goes Nuclear: Interestingly, it's not just the U.S. and China that are moving fast. In the oil-rich Middle East, civilian nuclear energy is already gaining momentum. Saudi Arabia and the UAE are investing billions in civilian nuclear programs. The Emirates have four operational reactors. Saudi Arabia has built an advanced research reactor and is actively exploring commercial options— a process we should all hope unfolds with Western partners at the table. And Israel? Despite being a global hub for innovation, Israel is sitting on the sidelines. In the 1960s, a site in the Negev desert was designated for a future nuclear power station. But six decades later, there's been no real progress—no regulatory roadmap, no investment pipeline, no public discourse. In a country that prides itself on technological leadership, the silence is striking.

But this moment presents Israel with both a strategic opening and a national duty. First, Israel should create a regulatory framework to enable a first civilian reactor and support emerging nuclear technologies. This doesn't require new legislation—just cabinet decisions and budget allocations. The government should set a national target of 5GW of nuclear-generated power by 2050, allocate land for dedicated projects, cap permit approval at 18 months, invite American operators to the table, and fund academic research centers focused on nuclear innovation. Second, government, public and private entities should invest in next-generation technologies that make nuclear energy safer, cheaper, faster to deploy, and more compact. This isn't just a local play—it's a

strategic one.

Israel has the potential to become a key partner to the U.S. in developing smart, small-scale, cost-effective nuclear solutions. SMRs, for example, could be a strategic asset—linking Israel to U.S., European, and Gulf energy initiatives. Such a partnership could align with Saudi Arabia's Vision 2030 and strengthen the foundation of the Abraham Accords. It's also smart diplomacy: If Israel can offer the Saudis and the Gulf states economic reasons to deepen energy ties—particularly around civilian nuclear collaboration—it strengthens the political alliances that matter most. As a son of a diplomat, I've learned this much: sometimes, megawatts lead where diplomats alone cannot. This isn't optional—it's foundational.

Civilian nuclear energy is no longer niche or theoretical. It is fast becoming a cornerstone of the global economy. It's a prerequisite for the data age, for AI at scale, and for the quantum revolution. It is also emerging as a battleground for influence between East and West—and American dominance is far from guaranteed. The UAE is already in the game. Saudi Arabia is on its way. The U.S. is rebooting. The rest of the world is moving. And yet Israel—home to some of the world's most creative engineers—is still watching from the bleachers.

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It's not too late. The next two decades will be an era of rapid nuclear acceleration. With its speed of innovation, Israel can be a true technology partner to U.S. markets and a bridge to regional allies. The old view of Israel as a liability—shaped by decades of Arab oil politics—has long faded in Washington, replaced by recognition of Israel's technological and security edge. But today, Israel can go even further: not just shedding the liability label but becoming a strategic energy asset to both the U.S. and nations looking to diversify.

Source: https://www.ynetnews.com/opinions-analysis/article/r1kgjifmxl, 08 June 2025.

OPINION – Peter Gichuki

Kenya's Nuclear Future Must be Powered by Trust

On May 3, 2025, local leaders in Kilifi County made headlines by unanimously rejecting a proposal to host a nuclear power plant. Their decision wasn't just a reaction to the idea of nuclear energy—it was a protest against being excluded from the process. For many residents of Uyombo, the proposed site, this wasn't just about concrete and radiation. It was about consent, information, and their right to shape their own future.

Most locals say they were never consulted. The only narratives they had heard came from anti-nuclear advocacy groups warning of radiation risks. Meanwhile, the government and its agencies offered little in the way of timely, accessible, or comprehensive information. Crucial questions—about displacement, environmental impact, and economic disruption—were left unanswered. Beyond the fear of radiation, there were legitimate concerns about losing homes, land, and livelihoods. Many community members are farmers and fishermen who felt blindsided by a process that appeared opaque and top-down. Without a clear explanation of how Uyombo was selected, residents felt like casualties of a larger national plan in which they had no voice.

This approach must change. Kenya should consider a more inclusive and democratic model: a county-led competition to host nuclear reactors. This system—already in practice in countries like Norway—places power in the hands of communities. There, municipalities like Farsund and Lund sign cooperation agreements with nuclear companies to explore feasibility. Early-

stage studies follow—evaluating site suitability, environmental impact, and community benefits—before any decision is made.

In Kenya, counties willing to host a plant should submit public bids outlining how they plan to manage safety, protect the environment, and leverage the plant to bring jobs, clinics, schools, and infrastructure to their people. These proposals should be debated and refined by citizens and county assemblies before being presented to the State. Only the bids that balance Vision 2030 goals with genuine local support would move forward.

This approach must change. Kenya should consider a more inclusive and democratic model: a county-led competition to host nuclear reactors. This system—already in practice in countries like Norway—places power in the hands of communities. There, municipalities like Farsund and Lund sign cooperation agreements with nuclear companies to explore feasibility. Early-stage studies follow—evaluating site suitability, environmental impact, and community benefits—before any decision is made.

This bidding model offers transparency, consent, and accountability. It ensures communities are not just consulted, but are active participants in shaping Kenya's energy future. For this to succeed, however, Kenya's Nuclear Power and Energy Agency (NuPEA) and the Ministry of Energy must rethink how they communicate. Issuing press releases is not enough. We need boots on the ground—outreach teams in every county, public forums, local radio programs, and community information centres operating in indigenous languages. While NuPEA says it has held forums and published materials in local dialects, Kilifi's backlash reveals these efforts have fallen short. The cornerstone of any nuclear rollout must be informed consent. Nuclear energy, alongside renewables, offers Kenya a real path toward industrialisation.

Source: https://www.standardmedia.co.ke/business/opinion/article/2001520856/kenyas-nuclear-future-must-be-powered-by-trust, 04 June 2025.

OPINION – Hamish de Bretton-Gordon

A Nuclear Strike on Britain is a Real Possibility. Here's What We Need To Do

The Strategic Defence Review announcement this week that the MoD and the NHS must prepare for nuclear attack and that the British Army must be able to fight and survive in a radiation contaminated environment has caused some upset and alarm. President Putin has just told Donald Trump he will exact severe revenge on Ukraine for destroying his nuclear bombers: there are those who fear that he might follow through on previous nuclear threats.

The threat we have not mitigated today is that of a tactical nuclear strike against Ukraine – or against Britain. Putin would be likely to calculate that we would not launch a massive strategic counterstrike, probably resulting in Armageddon, in response to such an attack. And we have no credible tactical nuclear options, having unwisely decommissioned these in 1997 as part of the "peace dividend". Funnily enough it was also in 1997 that the Ukrainians gave up their nuclear weapons, a decision they surely regret now. Let us hope that talk of the UK acquiring F-35A jets armed with tactical nuclear weapons leads to some action: this would be a credible deterrent against a tactical attack.

Certainly, when the 'N' word is mentioned, amongst the uninitiated or those with overactive imaginations, panic ensues. We should not panic, but the Kremlin's regular nuclear threats towards London and Kyiv – and Russia's massive use of chemical weapons in Ukraine – must be taken seriously: very seriously. But when I say there is no call for panic, I am confident. I have dealt with real world chemical attacks and I am well versed in the realities of dealing with nuclear strikes. All threats can be mitigated. It is the threat we miss, or think too difficult to counter, that is likely to cause us strategic upset.

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against Britain. Putin would be likely to calculate that we would not launch a massive strategic counterstrike, probably resulting in Armageddon, in response to such an attack. And we have no credible tactical nuclear options, having unwisely decommissioned these in 1997 as part of the "peace dividend". Funnily enough it was also in 1997 that the Ukrainians gave up their nuclear weapons, a decision they surely regret now. Let us hope that talk of the UK acquiring F-35A jets armed with tactical nuclear weapons leads to some action: this would be a credible deterrent against a tactical attack.

Alongside this, we must indeed prepare again, as we did in the Cold War, to survive and operate after a nuclear and or chemical strike. The MoD and NHS have been directed to stockpile kit to show not least to the Russians that we are resilient to such an attack, creating doubt in the Kremlin as to how effective it might be. The Strategic Review puts domestic production of military kit at the heart of the overall strategy, and for once this is not a problem. Britain is fortunate that in Avon Protection in Wiltshire we have the leading manufacturer of gas masks on the planet, providing the US, the UK, most of Nato and now also the Ukraine army with respirators.

We also have Kromek plc in Durham who are the world leaders in radiation detection and monitoring. These two essential firms will help a lot in delivering the level of resilience required to put the Russians off – and hopefully the levels of assurance to calm the panickers at home. We live in extraordinary times and with Presidents Trump and Putin calling the shots, unfortunately anything is possible, including nuclear attack. Let us hope that this time Trump can pull Putin back from the brink, and we can bring the nuclear balance in Europe back to equilibrium.

Source: https://tinyurl.com/98se4ahf, 05 June 2025.

OPINION – Ju Hyung Kim

How South Korea can Deter North Korea's Nuclear Gambit with Precision Air and Naval Power

The Atlantic Council's recent report, A Rising Nuclear Double-Threat in East Asia: Insights from Our Guardian Tiger I and II Tabletop Exercises, has reignited urgent conversations about deterrence credibility in the Indo-Pacific. The simulations explore a chilling dual contingency scenario: simultaneous crises in the Taiwan Strait and on the Korean Peninsula. Most alarmingly, both tabletop exercises assume that North Korea employs tactical nuclear weapons against South Korean targets, while the United States, despite its long-standing promises that Seoul is under its nuclear umbrella, refrains from nuclear retaliation. This troubling gap between declaratory policy and demonstrable resolve casts a long shadow over US extended deterrence guarantees in the region.

In a geopolitical environment where South Korea remains a non-nuclear state by policy and design, the question then becomes: How can Seoul — and by extension, the US-ROK alliance — credibly respond to such a grave provocation without resorting to nuclear escalation? The answer lies not in deterrence by punishment through nuclear reprisal, but in demonstrating the capacity for rapid, precise and survivable conventional preemptive strikes.

In a geopolitical environment where South Korea remains a non-nuclear state by policy and design, the question then becomes: How can Seoul — and by extension, the US-ROK alliance — credibly respond to such a grave provocation without resorting to nuclear escalation? The answer lies not in deterrence by punishment through nuclear reprisal, but in demonstrating the capacity for rapid, precise and survivable conventional preemptive strikes. Specifically, this requires serious investment and doctrinal planning around real-time intelligence, surgical air operations, and advanced stand-off missile capabilities aimed at decapitating North Korea's leadership or neutralizing its nuclear command-and-control nodes before launch orders can be executed.

Rather than waiting to retaliate after a tactical nuclear strike, South Korea must develop credible preemptive precision strike capabilities that can neutralize North Korea's nuclear-use chain at the point of activation. This is not about launching a

preventive war but about maintaining the ability to act in real time when intelligence confirms that a launch is imminent. A doctrinal shift toward decisive, anticipatory conventional action — using survivable assets like stealth aircraft, terrain-hugging cruise missiles, and electronic warfare support — can shift the cost-benefit calculus for Pyongyang. The very existence of such a capability, if paired with clear signaling and allied coordination, can deter tactical nuclear use by threatening to deny the regime its window of opportunity before launch authorization can be executed.

Capabilities wise, this is a feasible solution. Though North Korea has long been portrayed as a "porcupine" state bristling with layered air defense systems, the actual quality and viability of those defenses are increasingly questionable. While Hollywood dramatizations like Top Gun: Maverick portray Soviet-era systems such as the SA-3 as deadly and resilient, historical precedent suggests otherwise. In 1987, a Cessna light aircraft flown by a West German teenager famously penetrated the Soviet Union's tri-layered air defense network and landed near Red Square. In 2020, Turkish F-16s conducted precision strikes inside Syria with impunity, revealing the vulnerability of Damascus's aging Soviet-derived air defense systems. Even the Russian invasion of Ukraine has shown that supposedly robust integrated air defense systems (IADS) can be saturated or circumvented by concerted efforts involving electronic warfare, decoys, and low-RCS munitions.

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North Korea's core surface-to-air missile arsenal — comprising the SA-3, SA-5, and man-portable SA-7 platforms — is outdated by modern standards. While the KN-06 — its domestically developed analogue to the Russian S-300 — has been declared operational since 2017, its effectiveness against modern electronic warfare suites and low-observable platforms remains doubtful. In a high-stakes scenario, electronic suppression operations could likely render much of Pyongyang's air defense network blind and deaf within minutes. The compact and clustered distribution of North Korean radar and SAM sites further increases their vulnerability to coordinated SEAD campaigns.

The Republic of Korea Air Force (ROKAF) has been incrementally building such capabilities. Its F-35A stealth fighters can carry up to eight Small Diameter Bombs (SDBs), each capable of precision strikes with minimal radar signature. A viable preemptive strategy would involve F-35s flying northwest via the West Sea, bypassing the radar-saturated DMZ corridor, and then veering east toward high-value targets in Pyongyang. This flight profile takes advantage of radar gaps, terrain masking, and reduced radar cross-section, maximizing survivability. Combined with escort jamming platforms and decoys, such a penetration route minimizes exposure while maximizing operational effect.

Complementing this aerial strategy is the Republic of Korea Navy's Daegu-class frigates, equipped with SSM-750K Haeryong (Sea Dragon) tactical ship-to-surface cruise missiles. These missiles can be programmed for low-altitude flight paths, such as along the Taedong River, enabling them to avoid radar detection while delivering high-lethality payloads like cluster munitions to hardened targets. Fired from the West Sea, such strikes could serve both as a demonstrative posture and, if necessary, a preemptive deterrent against impending North Korean escalation. These naval assets, when integrated into a broader strike package involving unmanned systems and long-endurance ISR platforms, can create persistent dilemmas for North Korean planners.

Moreover, this concept can be layered into broader allied planning. Japan's expanding strike capabilities — including the acquisition of Tomahawk missiles (expected to become

operational later this decade), the modernization of its F-35 fleet, and its integration with US missile defense systems — further strengthen this deterrent architecture. While Japan and South Korea do not operate integrated missile defense networks, recent trilateral agreements have established real-time missile warning data sharing, enhancing situational awareness and crisis coordination. In a fully coordinated posture, a North Korean tactical nuclear strike would not be met merely with rhetorical condemnation or ambiguous threats, but with credible, prompt, and precise disruption of the regime's ability to escalate further.

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This approach differs from traditional preemption in that it is conditional and intelligence-driven — a last-resort option to be used only when clear indicators of imminent nuclear use emerge. Unlike KMPR's reactive logic, it seeks to dissuade first use by raising the probability that any such order will be interrupted at the command level, before it can be carried out. It is a form of deterrence by denial, not deterrence by punishment. The Guardian Tiger scenarios, though fictional, underscore a grim but plausible future. But they need not become prophecy. By shifting doctrine from retaliation to preemption, and ensuring that precision strike capabilities are real, survivable, and understood by adversaries, South Korea and its allies can fill the credibility gap in extended deterrence. Deterrence in the 2020s will not be about symmetry — it will be about timing, survivability, and tailored denial.

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Source: https://breakingdefense.com/2025/06/how-south-korea-can-deter-north-koreas-nuclear-gambit-with-precision-air-and-naval-power/, 06 June 2025.

NUCLEAR STRATEGY

CHINA

NATO Warns of China's Growing Nuclear Arsenal and Naval Power by 2030

China is actively expanding its military power and nuclear arsenal. NATO Secretary General Mark Rutte stated during his speech at the Royal Institute of International Affairs in London on June 9 that by 2030, Beijing could have over a thousand nuclear warheads and 435 combat ships. According to NATO forecasts, by 2030 China could have up to 435 combat ships. Additionally, Beijing is actively working to increase its nuclear arsenal. Rutte emphasized that Chinese authorities intend to raise the number of operational nuclear warheads to over a thousand by the end of this decade.

According to Pentagon data, as of 2024, China possessed approximately 600 operational nuclear warheads, more than double their number in 2020. This raises concerns in the US and its allies due to the lack of transparency in China's nuclear strategy. Officially, China adheres to a "no first use" policy, but it is actively expanding missile systems capable of carrying nuclear weapons and strengthening its military presence in the South China Sea. The expansion of China's naval fleet and modernization of strategic forces cause concern not only in Washington but also among NATO countries, especially given Beijing's close

cooperation with Russia.

Source: https://mezha.net/eng/bukvy/nato-warns-of-china-s-growing-nuclear-arsenal-and-naval-power-by-2030/, 09 June 2025.

RUSSIA

Nuclear Weapons 'Now Justifiable' by Russia as New Doctrine Sparks Serious Concerns for the West

Nuclear weapons are now justifiable by Russia, a political expert has warned following Ukraine's drone attacks. Speaking to GB News, Stephen Hall, a lecturer in Russian politics at the University of Bath, explained about how the updated Kremlin nuclear doctrine should spell concern for the West. He said: "If nuclear missiles or systems that can fire those missiles are attacked, that could constitute a decision by the Kremlin for a nuclear response."

Analysts have said this attack, whilst clearly methodically planned over months with the support of Western allies, should could be a warning to countries of significant military capability. Tom Shugart, a defence analyst at the Washington think tank CNAS, highlighted his concerns that such an attack could be feasible on the US. He said on X: "Containers at rail-yards, on Chinese-owned container ships in port of offshore, on trucks at random properties…spewing forth thousands of drones that sally forth and at least mission-kill the crown jewels of the [US Air Force].

Among the key targets for the attack were Tu-95, Tu-160 and Tu-22 bombers, which are capable of carrying nuclear weapons and have been one of the key components of Putin's bombing campaign of Ukraine. A-50 support aircraft were also targeted during the attack. Kyiv has claimed that 41 of these strategic bombers have been damaged and "at least" 13 have been destroyed. Moscow has denied that any aircraft have been destroyed and claims that only some planes were damaged. Operation Spiderweb, which took place over the weekend, was a daring operation which was 18 months in the making by Ukrainian forces.

Sources in the SBU claim that the operation involved over 100 drones, targeting four separate airbases within Russia. Belaya in the Irkutsk region in Siberia, Olenya in the Murmansk region, which is within the Arctic Circle, Ivanovo to the north-east of Moscow and Dyagilevo, which lies to the south-east of the capital, where all simultaneously attacked during the operation. Belaya airbase lies over 2,500 miles from Ukraine's border, demonstrating the ambition of the attack.

Professor Hall further outlined the complexity of carrying out such an operation, which targeted locations that were thousands of kilometres apart from one another. He said: "Convincing Russian lorry drivers, filling lorries up with drones, getting them into Russia, and doing it all remotely. Remotely removing lids, remotely opening tops of lorries and remotely fly the drones off and do the damage. It's a significant development seeing the Ukrainian's pulling this off." The Ukrainian President Volodymyr Zelensky heralded the operation as an "absolutely brilliant result." He said: "Russia has had very tangible losses, and justifiably so."

However, Professor Hall did emphasise that he thought the possibility of a nuclear response from Russia was unlikely. "The Kremlin is not as isolated as the West would like to believe, it has allies in India and China and in the global south that are working with the Kremlin," he added. If Russia were to use a nuclear weapon against a non-nuclear power such as Ukraine, that would break those alliances."

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thousands of drones that sally forth and at least mission-kill the crown jewels of the [US Air Force]."

The Hudson Institute, another Washington based think tank, also highlights how the US would be woefully underprepared if such an attack would be inflicted by China. "The United States' airfields face a threat of severe Chinese military attack... the US military has devoted relatively little attention, and few resources, to countering these threats compared to developing modern aircraft." It comes after Sir Keir Starmer's recent announcement at the Strategic Defence Review to develop a dozen nuclear attack submarines, in parallel with Australia and the US through the AUKUS pact. The review also promised a £15 billion investment in the "sovereign warhead programme", essentially the development of more nuclear weapons. This is primarily in response to Russia's aggression against Ukraine. John Healey, the Defence Secretary, said that the announcement of an increase in nuclear armament was aimed to "send message to Moscow". "This is Britain standing behind making out Armed Forces stronger but making our industrial base stronger, and this part of our readiness to fight if required."

Source: https://www.gbnews.com/news/world/nuclear-weapons-russia-ukraine-drones-warning-west, 04 June 2025.

USA

Air Force Ready to Deploy More Nukes Once Arms Control Treaty Ends

The Air Force is ready to add more nuclear warheads to its bomber aircraft and underground missiles if ordered to do so when a key arms control treaty expires next year, its top nuclear officer said June 5. Air Force Global Strike Command boss Gen. Thomas A. Bussiere, during a discussion of the U.S. strategic arsenal hosted by the Atlantic Council, said that when the New START Treaty ends in February 2026, "there may be a direction to provide additional capacity, both on the land leg and the bomber leg." "If directed, we are ready and prepared to execute" that order, he said. "We have the capability and capacity to do it."

Bussiere also talked about the likely need for more than 100 stealthy, long-range B-21 Raider bombers, and the expansion of America's nuclear force in response to the rise of new nuclear powers. New START, which entered into force in 2011, limits the number of launchers—like a plane, submarine or missile—with nuclear warheads that can be deployed by the U.S. and Russia. The 400 deployed Minuteman III intercontinental ballistic missiles were designed to carry three warheads but use only one apiece to comply with the treaty. Global Strike periodically test-launches the missiles with MIRVs, which would each carry a nuclear warhead in a real attack. It most recently did so in November from Vandenberg Space Force Base in California.

The Air Force could also put more nuclear weapons on its B-2 Spirit and B-52 Stratofortress bombers if funded and directed to, the spokesperson said, but "specific postures and plans would be directed by the National Command Authority," comprised of the president and defense secretary. The U.S. and Russia in February 2021 agreed to extend New START for five years, but Russia announced in 2023 that it didn't intend to continue the deal past 2026.

A spokesperson for the command said that just because the Air Force could put missiles with multiple warheads on alert if no longer bound by a treaty, that doesn't mean it will. The Air Force could also put more nuclear weapons on its B-2 Spirit and B-52 Stratofortress bombers if funded and directed to, the spokesperson said, but "specific postures and plans would be directed by the National Command Authority," comprised of the president and defense secretary. The U.S. and Russia in February 2021 agreed to extend New START for five years, but Russia announced in 2023 that it didn't intend to continue the deal past 2026. Until February, "we are encumbered by the restrictions and limits" of New START, Bussiere said. "There is no follow-on arms control."

Modernizing Missiles: As the end of New START draws closer, efforts to deploy a new generation of nuclear weapons face fresh criticism in Washington. Among them is the Sentinel ICBM, which would replace Minuteman III missiles and can also carry multiple warheads. The Pentagon found last summer that the troubled initiative was over budget by 81 percent, for an estimated cost of nearly $141 billion, and delayed by three years. The Air Force is restructuring the program to avoid future cost overruns that could trigger additional congressional oversight and slowdowns.

Lawmakers on both sides of the aisle on June 5 pressed Air Force officials to show they're taking the Sentinel program seriously. The new ICBM is the program that has occupied the most of his time since becoming secretary last month, Air Force Secretary Troy E. Meink said.

Lawmakers on both sides of the aisle on June 5 pressed Air Force officials to show they're taking the Sentinel program seriously. The new ICBM is the program that has occupied the most of his time since becoming secretary last month, Air Force Secretary Troy E. Meink said. It's one of his top three priorities, he said, if not the highest. "We're doing everything we can to get it back on track," he said.

Bussiere said the so-called Nunn-McCurdy breach was largely spurred by the costs of building Sentinel launch facilities and command-and-control infrastructure—effectively, the sheer scope of the civil engineering effort. While the program remains delayed by up to two years, he said, other aspects of the program "are ongoing and going well." "I'm encouraged by the activities that are going on right now between industry, our ops and maintenance professionals, and the acquisition professionals," Bussiere said. "We are seeing some great opportunities in the restructure of the program."

House Armed Services Committee Chairman Rep. Mike Rogers (R-Ala.) questioned why the service has moved $1.2 billion provided for the Sentinel program to fund other priorities in fiscal 2025, and said he's concerned the new missiles won't be ready in time to replace the Minuteman IIIs before they're too old to be effective. At the Atlantic Council event, Bussiere said Global Strike has a "very deliberate plan" for keeping enough Minuteman III missiles available to meet the minimum number needed for deterrence while transitioning missile launch facilities and control centers to the Sentinel program. It is "a national imperative" to keep Minuteman III functional until Sentinel can replace it, he said.

This is only the second time the U.S. has sought to replace its nuclear enterprise, and the first since the 1980s. Global Strike is now juggling the complex and expensive ICBM modernization at the same time as it brings on the B-21 to replace the B-1 and B-2 bombers, a new air-launched cruise missile and other pieces of the strategic arsenal. That challenge will "take an effort and a lift from everybody," Bussiere said. "If we had to do it again," Bussiere said, "we might look at maybe doing one leg [of the nuclear triad] every 10 years, versus all three legs at the same time."

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He hinted the U.S. may need a more robust nuclear force structure to counter future threats. Since 2010, China has become a near-peer nuclear power to the U.S. and Russia and is continuing to bolster its strategic arsenal, while North Korea has also built up its nuclear forces. North Korea is receiving nuclear missile guidance know-how from Russia in exchange for sending troops and other aid to Russia for its war against Ukraine,

Bussiere said. In February, President Donald Trump said he wants to pursue arms control talks with Russia and China and bemoaned the amount of money the U.S. plans to spend on new weapons.

"There's no reason for us to be building brand new nuclear weapons, we already have so many," Trump told reporters in the Oval Office. "You could destroy the world 50 times over, 100 times over. And here we are building new nuclear weapons, and they're building nuclear weapons. We're all spending a lot of money that we could be spending on other things that are actually, hopefully much more productive," Trump said. The nonpartisan Congressional Budget Office projected in April that operating and modernizing U.S. strategic forces will cost $946 billion through 2034; other estimates reach $1.5 trillion over the systems' lifetimes. Proponents of the effort argue keeping other nuclear-armed nations at bay is worth the price. ...

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Growing the Bomber Force: The rise of other nuclear powers has revived the question of how large America's nuclear arsenal, particularly its bomber fleet, should be. Bussiere maintains the Air Force can most easily accommodate growth in its bomber force, which can also be used for non-nuclear strike missions. The Air Force plans to buy at least 100 B-21s, which cost around $692 million apiece as of 2022. But the service is "starting to see a number of combatant commanders, a number of members of the [Defense] Department, as well as Congress, asking the question, 'Is 100 enough?'" Bussiere said. The idea of boosting the buy to 145 B-21s is "predicated on an earlier threat," he said. "We need to explore . . . what the right number is," Bussiere said. "The good news is, I think we have time to make that decision."

The massive Republican-led tax-and-spending package under consideration on Capitol Hill includes $4.5 billion to ramp up B-21 production at Northrop Grumman and expand its supplier base. The Senate version of the bill would allow the Air Force to spend the money only on aircraft that are made possible by greater production capacity. The B-21's production rate is a closely held figure, but may be as low as seven or eight airplanes per year. "If Congress gives us the additional money, then it'll be a decision from the Department of Defense and the Department of the Air Force, with the Secretary's direction, to get the contractor to ramp up that number," Bussiere said.

If the Air Force opts to buy more than 100 B-21s, officials will explore whether to house more Raiders at its three main bomber bases or if other bases should host the planes, Bussiere said. The B-21 is slated to arrive first at Ellsworth Air Force Base, South Dakota, followed by Whiteman AFB, Missouri, and Dyess AFB, Texas. Despite the rapid advance of autonomous aircraft, Bussiere said he does not expect there will be an autonomous nuclear bomber program in his lifetime, insisting that committing to the use of nuclear weapons is "a human decision." Under the original B-21 contract, however, Northrop Grumman is required to make the B-21 usable without humans on board.

Source: https://www.airandspaceforces.com/air-force-ready-to-deploy-more-nukes-once-arms-control-treaty-ends/, 06 June 2025.

BALLISTIC MISSILE DEFENCE

CHINA

In a Rare Move, China Releases Crucial Details about 12,000-KM Nuclear Missile that can Strike the U.S. Anywhere!

Known for its secretive nuclear weapons program, China has for the first time revealed key details of one of the country's nuclear weapons. In a rare gesture that has taken China watchers by surprise, China's state broadcaster CCTV has released crucial details about one of the country's premier nuclear-capable missile systems, the DF-

5. China's nuclear program has traditionally been highly secretive, particularly regarding specific missile capabilities and deployments, and it was not clear why the information about the DF-5, an ICBM, was made public.

The timing of the disclosure is also interesting, as it comes just days after the 2025 Shangri-La Dialogue in Singapore, Asia's largest defense and security forum. Here, the US delivered a clear message: The Indo-Pacific is a top priority for the Trump administration amid what it sees as China's aggressive posturing. At the dialogue, US Defense Secretary Pete Hegseth urged Asian allies to step up their defense in response to China's military build-up near Taiwan. Hegseth mentioned China more than 20 times in his first-ever speech at Shangri-La and issued a direct warning to Beijing. "Any attempt by Communist China to conquer Taiwan by force would result in devastating consequences for the Indo-Pacific and the world. There's no reason to sugarcoat it," Hegseth said. He also underlined that the US is serious about countering China's rising influence in the West as well. "We're also increasing security in the Western Hemisphere and taking back the Panama Canal from malign Chinese influence. It is key terrain, after all. China did not build that canal. We did. And we will not allow China to weaponize it or control it," he said.

The tone of Hegseth's speech took many by surprise. China, certainly, was taken aback. "If deterrence fails, and if called upon by my Commander in Chief, we are prepared to do what the Department of Defense does best – fight and win — decisively," he said. The public unveiling of DF-5 could be a response to Hegseth's speech. The ICBM DF-5 has a range of 12,000 km and is capable of reaching the US mainland as well as Western European countries. This could be China's way of showing its capabilities and sending a message that Beijing is serious about protecting its sovereignty and interests.

***The DF-5 And Its Capabilities*:** In China, official disclosures typically use vague language, avoiding precise details about the weapons. However, the broadcast on June 2 was unique in that it provided specific and in-depth information about a strategic Chinese nuclear missile. It disclosed that the two-stage missile, which it described as China's "first-generation strategic ICBM," could deliver a single nuclear warhead with an explosive yield of between 3 and 4 megatons of TNT. For perspective, this is roughly 200 times greater than the atomic bombs dropped by the US on Hiroshima and Nagasaki at the end of World War II. It added that the missile had a maximum range of 12,000 km (7,460 miles), sufficient to strike the continental United States and western Europe, and was accurate to within 500 meters.

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The report further said that the missile was "32.6 meters in length with a diameter of 3.35 meters and a launch weight of 183 tons." During the broadcast, former People's Liberation Army instructor Song Zhongping said the missile, which was developed in the early 1970s and entered service in 1981, played a critical role in China's nuclear deterrence strategy. "Without the DF-5, China wouldn't be regarded as a nation with credible intercontinental strike capability. It was instrumental in China's emergence as a nuclear power, demonstrating to the world that China must be taken seriously," Song said.

According to Missile Threat, a platform dedicated to missile technology, "The DF-5 (Dong Feng-5 / CSS-4) is a silo-based ICBM. It was the first ICBM that China developed, and has one of the longest ranges. These missiles are capable of delivering

large nuclear payloads throughout the United States and Western Europe." The DF-5 also served as the basis for several other military and space programs. "These efforts included the Long March-2C space launch vehicle, the DF-6 fractional orbital bombardment program (cancelled), the PRC penetration aid program, and the DF-5B," it said.

The DF-5B is similar to the capabilities of the DF-5, but can carry MIRVed warheads. The MIRV, or Multiple Independently Targetable Reentry Vehicle, technology enables a single missile to carry and release multiple nuclear warheads, each capable of striking a different target across a wide geographic area. Furthermore, in 2017, media reports surfaced that China had tested a new variant of the missile, the DF-5C, which is equipped with 10 MIRVs.

A Hidden Warning to the World? Former PLA instructor Song Zhongping suggested that revealing details about the DF-5 could also mean that China is now in possession of much more advanced nuclear weapons and missile silos. Thus, Beijing feels confident in releasing key specifications of the DF-5 into the public domain. "What we're seeing is the phasing out of older systems – ones that have already served their purpose. The message is clear: China has far more powerful capabilities it has not shown the world." It is worth noting that China also has ICBMs like DF-31 and DF-41 in its arsenal. Last year, China conducted a successful test of the DF-31. Incidentally, this was the first time in four decades that China acknowledged testing an ICBM. According to SIPRI, China is the third-biggest nuclear power in the world after Russia and the US. In 2024, Beijing had over 500 nuclear warheads in its arsenal. However, according to the Pentagon estimates, China already has over 600 nuclear warheads, and it will have an arsenal of over 1,000 nuclear weapons by 2030.

Source: https://www.eurasiantimes.com/china-reveals-key-details-about-its-advanced-nuclear-weapons/, 05 June 2025.

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IRAN

Iran Orders Materials from China that can Make Some 800 Ballistic Missiles

Iran has ordered from China large quantities of materials for producing ballistic missiles, according to a Thursday report in the *Wall Street Journal* that said the Islamic Republic is seeking to reestablish itself and its proxy network militarily. The report came amid ongoing Iran-US nuclear talks, which began in April. Israel has informed the White House that it will not strike Iranian nuclear sites unless the talks fail, according to a separate report by Axios. The Journal report, which cited people familiar with the transaction, said Tehran had ordered enough ammonium perchlorate to potentially manufacture up to 800 missiles. The material is used to produce solid-fuel missiles.

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The material is reportedly expected to arrive in Iran in the coming months. The Journal said the shipment had been agreed upon "months ago, likely before" US President Donald Trump's announcement in March that he had proposed nuclear talks to Iran's Supreme Leader Ayatollah Ali Khamenei. The ammonium perchlorate was ordered by an Iranian entity called Pishgaman Tejarat Rafi Novin Co. from the Hong Kong-based Lion Commodities Holdings Ltd., the Journal reported. The report said Pishgaman could not be reached for comment and Lion Commodities' director did not respond to a request for comment. An official cited in the report said some of the ammonium perchlorate is

expected to be sent to pro-Iran proxy groups such as Yemen's Houthi rebels, who have repeatedly launched ballistic missiles at Israel, most recently on Thursday.

Much of the material will reportedly remain in Iran as the country works to repair missile production plants that were damaged in October, when Israel responded to Iran's second-ever direct attack some six months after an earlier missile-and-drone strike. Israel's October strike destroyed about a dozen so-called planetary mixers, which serve to blend ballistic missile ingredients, the Journal said. A report earlier this week said Iran is also working to revive its air defense system after Israel's successive attacks on it. The Journal said Iran's UN delegation did not respond to a request for comment on the reported shipment of ammonium perchlorate. China's Foreign Ministry told the Journal that Beijing was unaware of a contract for such a shipment. "The Chinese side has always exercised strict control over dual-use items in accordance with China's export control laws and regulations and its international obligations," said the spokesperson.

An earlier Chinese shipment of missile fuel material has been linked to a blast in a southern Iranian port that state media said killed at least 18 people and wounded hundreds. That shipment, which Iran has not acknowledged, contained enough ammonium perchlorate precursor to produce 260 short-range missiles, the Journal said, attributing the blast to mishandling by a unit from the Quds Force of Iran's Revolutionary Guard. Iran, whose leaders are sworn to destroy Israel, has long funded and armed a network of regional proxies, the so-called Axis of Resistance, that includes Yemen's Houthis, Lebanon's Hezbollah and Gaza's Hamas, as well as separatist militias in Iraq. Iran reportedly sent ballistic missiles to its Iraqi proxies in early April, despite the start of the nuclear talks that month and earlier reports that those militias were disarming.

Following five rounds of negotiations, the US on Saturday presented Iran with a proposal for a deal that would reportedly restrict the Islamic Republic's uranium enrichment without halting it entirely. Khamenei rejected the proposal. Iran has consistently denied seeking to acquire nuclear weapons.

Following five rounds of negotiations, the US on Saturday presented Iran with a proposal for a deal that would reportedly restrict the Islamic Republic's uranium enrichment without halting it entirely. Khamenei rejected the proposal. Iran has consistently denied seeking to acquire nuclear weapons. However, it has been enriching uranium to levels that have no peaceful application, has obstructed international inspectors from checking its nuclear facilities and expanded its ballistic missile capabilities, and its officials have increasingly warned that they could pursue the bomb. It has amassed enough uranium enriched to 60% — a short step away from weapons grade — for nine bombs, and has carried out secret nuclear activities with material not declared to the UN's IAEA nuclear watchdog at three locations that have long been under investigation, the IAEA reported last week.

Prime Minister Benjamin Netanyahu has called for Iran's enrichment capabilities and nuclear facilities to be fully dismantled. US intelligence has assessed that Israel will attack the nuclear facilities this year. However, Israel has assured the White House that it won't launch an attack on Iran's nuclear facilities unless Trump signals that the ongoing negotiations with Tehran have failed, Axios reported Thursday, citing two Israeli officials familiar with the matter. One official said it could take several months before that happened, and Iran would try to prevent the talks from collapsing.

During a visit last week by Strategic Affairs Minister Ron Dermer, Mossad Director David Barnea and National Security Adviser Tzachi Hanegbi, Israeli officials reassured the White House that Israel would not surprise the US by unilaterally striking Iran, the report said. An Israeli official quoted by the news site said, "We calmed the Americans and told them there is no logic in launching an attack if a good diplomatic solution can be found. This is why we are going to give it a

chance and wait with any military action until it is clear that negotiations have been exhausted and [White House envoy to the Middle East] Steve Witkoff has given up."

Though the IDF is constantly training for a strike on Iran, separate preparations for strikes on the Houthis have been misread by the US and other countries as a sign of an imminent Israeli attack on Iran, according to a senior Israeli official cited by Axios. The report added that Iranian and US negotiators are not expected to hold talks this weekend, despite reporting earlier this week that a sixth round could take place in the Middle East.

Although Biden and Xi previously agreed on the need to maintain human control over the decision to use nuclear weapons, the decision to integrate AI into nuclear command, control, and communications NC3 is far more complex than the decision to maintain a human-in-the-loop (Ministry of Foreign Affairs, November 17, 2024). From processing early-warning data to autonomous targeting, there are numerous ways of integrating AI into NC3 while maintaining people within the decision-making process.

Source: https://www.timesofisrael.com/iran-orders-material-from-china-that-can-make-some-800-ballistic-missiles-report/, 06 June 2025.

EMERGING TECHNOLOGIES AND DETERRENCE

CHINA

Experts See Risk and Reward to Integrating AI in Nuclear Weapons

In April 2025, Zhang Gaosheng, a researcher at the China Institute of International Studies, penned an article in The Paper pinpointing several mechanisms in which the integration of artificial intelligence (AI) into nuclear command, control, and communications (NC3) systems will increase the risk of nuclear escalation (*The Paper*, April 11). In particular, as AI technologies become increasingly embedded in critical nuclear infrastructure, the potential for miscalculation, system vulnerabilities, and unintended escalation grows more acute. It is, therefore, critical to understand how the PRC plans to integrate AI into its nuclear strategy.

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AI-Enabled Cyber and Conventional Systems Threaten Nuclear Survivability: Chinese experts are broadly concerned about AI's threat to nuclear strategic stability. The ability of AI to detect targets, sort through data, and improve decision-making speed can enhance counterforce capabilities and provide offensive advantages that can threaten adversary retaliatory capabilities (Center for International Security and Strategy, September 2, 2019). Chinese analysts have identified U.S. decisions to integrate AI into components of its NC3 system as threatening PRC second-strike capabilities. These decisions to enhance counterforce capabilities create arms race dynamics and drive up the requirements for a "strong strategic deterrent system". This, in turn, will trigger Chinese countermeasures to upgrade the mobility and penetration capabilities of its nuclear forces (Shanghai Institutes for International Studies, March 2025).

The Cyber-AI-Nuclear Nexus: PRC writings have emphasized emerging threats from AI-enhanced cyberattacks. As Xi Jinping declared while addressing the Central Leading Group for Cybersecurity and Informatization in 2014,

"Without cybersecurity, there is no national security" (Xinhua, February 27, 2014).

The development of AI-enabled cyberattacks could significantly increase the vulnerability of PRC nuclear forces. AI-powered autonomous agents and advanced persistent threats (APT) can analyze vast amounts of data to systematically detect, analyze, and exploit weaknesses in target systems. AI-enabled malware can also automatically alter its code to evade detection and recognize where potential zero-day vulnerabilities may appear. Chinese analysts have observed that such developments in AI-enabled cyberattacks could more easily allow adversaries to find and exploit weaknesses in systems that could disrupt nuclear infrastructure. The proliferation of AI and cyber capabilities could enable third parties and terrorists to sow discord among nuclear-armed countries through "smart intrusions".

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The speed at which AI-enabled cyberattacks can "paralyze" nuclear weapons systems could increase pressures to use nuclear weapons in a crisis, according to analysts from the National University of Defense Technology. This is due to the difficulty of attributing responsibility, detection, and issuing warnings in a short time period—especially if the country maintains a launch-on-warning posture (Information Security and Communications Privacy, October 11, 2021).

To address the threats posed by AI-enabled cyberwarfare, analysts writing in the *Journal of Intelligence* recommend increasing redundancies in information network systems, enhancing tailored defenses of infrastructure, and making the structure of critical infrastructure less predictable and harder to map (Journal of Intelligence, 2021).

AI can also improve cyber defenses by autonomously conducting vulnerability analysis, searching for breaches, and identifying APTs. Some speculate that AI can intensify a measure-countermeasure race in which several actors repeatedly identify vulnerabilities in adversary nuclear weapons systems and take corresponding actions to rectify vulnerabilities in their own systems (Center for Canadian Studies [CCS], November 24, 2020; Information Security and Communications Privacy, October 11, 2021).

Such vulnerabilities make the PRC's nuclear infrastructure a likely target in any crisis or wartime environment that involves cyber. Experts point to the Bush and Obama administrations' efforts to use cyberattacks to sabotage North Korea's nuclear weapons program as indicative of scenarios the PRC may face (CCS, November 24, 2020). To address the threats posed by AI-enabled cyberwarfare, analysts writing in the *Journal of Intelligence* recommend increasing redundancies in information network systems, enhancing tailored defenses of infrastructure, and making the structure of critical infrastructure less predictable and harder to map (Journal of Intelligence, 2021).

Blurring Conventional and Nuclear Threats: AI can also enhance conventional threats to nuclear forces. PRC experts have long feared that "non-nuclear strategic weapons" could threaten the country's nuclear forces. As a result of transformative technological advances in precision guidance and information networks after the Cold War, National Defense University scholar Zhang Yan emphasizes that conventional weapons and long-range precision strike capabilities could be used to threaten an adversary's nuclear forces (Military History, March 2018). Another analyst notes that the enhanced ability of the United States to detect,

track, and attack missiles through precision-guidance threatens PRC nuclear capabilities and weakens mutual vulnerability (Journal of International Security Studies, March 29, 2019).

The integration of AI with conventional weapons creates additional means of threatening PRC nuclear forces. As the United States and the PRC both attempt to integrate autonomy into drones to enhance conventional capabilities, experts have indicated that drone swarms can be used to threaten PRC nuclear facilities. As an op-ed in the PLA Daily, the official mouthpiece of the PLA, highlights, drone swarms can be used to penetrate multi-layered air defenses and launch pre-emptive strikes that threaten the PRC's nuclear counterattack capabilities and allow adversaries to gain advantage via "unilaterally assured destruction". These drone swarms can be used to target nuclear delivery vehicles, NC3 infrastructure, and early warning systems used to enable nuclear retaliation (*PLA Daily*, July 20, 2021).

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Some experts posit that AI will not enhance the ability of conventional forces, especially drone swarms, to threaten an adversary's nuclear delivery systems. Drones carrying conventional payloads are not effective in destroying reinforced silos and are less ranged compared to traditional ballistic missiles. Geographic factors also limit the ability of drones and other autonomous vehicles to hunt ballistic missile transporter erector launchers or SSBNs located in vast oceans, mountain caves, or other remote locations (*The Journal of International Studies*, 2020).

AI Opportunities in Early Warning and Remote Sensing: *Integrating AI in Early Warning and Data Processing* - Since 1964, the PRC has maintained a no-first-use declaratory policy, committing to not be the first country to use nuclear weapons in any conflict under any circumstances (Ministry of Foreign Affairs, July 23, 2024). At the same time, however, the U.S. Department of Defense assesses that the PRC is building a diverse array of space and ground-based early warning sensors designed to detect nuclear launch and provide the PRC an option to maintain a launch-on-warning posture and rapidly retaliate before a nuclear weapon has been detonated (Department of Defense, December 18, 2024).

Using early warning systems to inform decisions over nuclear use is data-intensive and labor-intensive. Chinese experts highlight that commanders and decision-makers may be overwhelmed by the large amount of information about adversary actions, preventing commanders from making quick and informed decisions. AI integration in nuclear early warning systems can quickly screen incoming data, improve the quality of data, and distinguish between false and real warnings to give decision-makers more time to respond. Outside of data processing, scholars foresee AI being used in a generative role to provide commanders with potential options to respond to nuclear and non-nuclear threats (Journal of Intelligence, 2021).

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Some experts nevertheless fear that AI models used for decision support in NC3 can be deceived, manipulated, or produce erroneous judgments in early warning systems. One Chinese observer asserts that a lack of high-quality training data could hinder the effectiveness of AI models, especially in the nuclear domain. With fewer relevant data points and limited access to data,

AI models are likely to produce unreliable outputs that could lead to failures in sensitive nuclear weapons systems. More maliciously, actors can use AI to create deepfakes that simulate videos or audio of senior civilian and military leaders that are leaked to another country's intelligence collection and analysis organization. Experts point out that such deepfakes can contribute to creating crisis instability, misperception, and strategic misjudgment (Information Security and Communications Privacy, October 11, 2021). AI models may also be susceptible to data poisoning by nefarious actors. This can be done when adversaries deliberately expose or hide information based on how an AI model weighs information to create analysis or predictions, causing the model to draw incorrect conclusions (*PLA Daily*, July 20, 2021).

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Stalking the Sea: The United States relies heavily on SSBNs as a key component of its nuclear triad to maintain its nuclear deterrence. It maintains 14 Ohio-class SSBNs—a larger fleet than the PRC's six operational Jin-class SSBNs, which it deploys for strategic deterrence missions. (The sea leg of the nuclear triad is one of the most survivable and critical components of the nuclear triad due to the difficulty of tracking SSBN in the deep sea.)

Chinese analysts indicate that AI technology and remote sensing can enable the deployment of autonomous underwater unmanned vehicles (UUVs) to detect, track, and attack SSBNs to reduce their survivability and limit their range. Their relatively cheap production could allow the PRC to deploy UUVs in large numbers to monitor choke points that SSBNs must pass through to reach or leave their patrol areas. Once the SSBN is identified, AI and remote sensing technologies could enable UUVs to continuously track SSBNs and prevent them from entering specific areas. One Chinese expert from the University of International Relations in Beijing points out that researchers are investigating the effects AI could have on SSBN survivability, because the PRC maintains fewer SSBNs that all perform worse than those of other nuclear powers. Others, however, dismiss the effect AI has on undersea warfare, pointing to the limitations on the ability to deploy enough UUVs to cover a wide enough stretch of sea to track and destroy SSBNs (The Journal of International Studies, 2020).

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Conclusion: The question of integration of AI in its nuclear forces continues to provoke active and ongoing debate within the PRC. Experts perceive AI as both an enabler and a threat in the nuclear domain. While it can enhance early warning, data processing, and decision support, it also introduces new vulnerabilities to nuclear forces. Scholars are especially wary of AI-enabled cyber threats to nuclear infrastructure and the potential vulnerabilities of AI models to cyberattacks in NC3. Understanding how the PRC conceptualizes the integration of AI into its nuclear strategy is critical for contingency planning, crisis management, and assessing future risks to strategic stability, as it allows planners to anticipate how the PRC may

respond to U.S. technological initiatives.

Across authoritative releases and white papers, the PRC for years has been emphatic about AI's potential in areas ranging from military systems to economic development. It has been opaque, however, on the nature of its nuclear build-up and operational concepts, let alone on specific plans for integrating AI within nuclear weapons systems. This means that any such analysis inherently has limited predictive power. Outlining a range of potential applications for AI in nuclear weapons as identified by Chinese experts nevertheless remains a valuable exercise—their views could inform future PRC policy and military development. Academic journals and PLA analyses likely will continue to publish on the topic, and are worth paying attention to as the debate develops in the years ahead.

Outlining a range of potential applications for AI in nuclear weapons as identified by Chinese experts nevertheless remains a valuable exercise—their views could inform future PRC policy and military development. Academic journals and PLA analyses likely will continue to publish on the topic, and are worth paying attention to as the debate develops in the years ahead.

Source: https://jamestown.org/program/experts-see-risk-and-reward-to-integrating-ai-in-nuclear-weapons/, 07 June 2025.

NUCLEAR ENERGY

CANADA

Canadian Leaders Outline Plans to Become Energy 'Superpower'

Prime Minister Mark Carney has set out the intentions of Canada's First Ministers to work together to establish the nation as a global energy superpower, streamlining the project approval and permitting process for "projects of national interest". At a meeting held in Saskatoon, Saskatchewan on 2 June, the premiers of Canada's provinces and territories discussed the federal government's plan to remove trade barriers and advance major projects of national interest, and agreed to work together to accelerate major projects that meet the criteria of strengthening Canada's autonomy, resilience, and security, supporting economic growth, have a high likelihood of successful execution, are a high priority for Indigenous leaders, and have clean growth potential, such as the use of clean technologies and sustainable practices.

Nation-building" infrastructure projects discussed by the premiers included critical minerals projects, "the next stage of nuclear, from uranium, to SMRs, to large-scale nuclear", and infrastructure investments including ports, and roads, Carney told a news conference at the conclusion of the meeting. "The point is to build the certainty, the stability and the ambition that builders need to catalyse enormous investment: investment to make Canada into an energy superpower and to build the strongest economy in the G7," he said.

"This is a first step in implementing a broader set of reforms to overhaul the project assessment process. A significantly improved, streamlined project assessment process is necessary for Canada to grow its economy to become the strongest in the G7 and a global energy superpower," the ministers said in a joint statement. The First Ministers "welcomed the Prime Minister's commitment to ensuring all federal assessment decisions are rendered within two years, beginning with projects of national interest" and agreed to work towards implementing 'one project, one review' with the goal of a single assessment for all projects - in a manner that respects federal, provincial, and territorial jurisdiction - to "help kickstart economic growth and ensure that projects get built in a timely manner." They also pledged to consult with Indigenous Peoples and discussed ways to strengthen Indigenous ownership and partnerships to provide Indigenous communities with "generational economic opportunities".

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Source: https://world-nuclear-news.org/articles/canadian-leaders-outline-plans-to-become-energy-superpower, 04 June 2025.

SMALL MODULAR REACTORS

ARGETINA

Argentina Aiming for SMR and Uranium Developments

Plans for the deployment of four ACR-300 small modular reactors and restarting uranium mining and enrichment were among the priorities outlined as Argentina's National Atomic Energy Commission celebrated its 75th anniversary. Demian Reidel, President of the Argentine Nuclear Council, told the event held at the site of the RA-10 multipurpose reactor: "With the development of the ACR-300, we will offer the world a clean, stable, and scalable source of energy. The ACR-300, a 300 MW technological marvel designed by Argentine engineers, is a centrepiece of the Nuclear Power Plan, which will position our country at the forefront of the new energy revolution.

"We are going to begin construction of four modules at the Atucha site, which will allow us to nearly double the country's installed nuclear capacity. This is only the first stage. Then, we will license this technology to the rest of the world. This will not only transform our energy mix, it will also change Argentina's export mix." Germán Guido Lavalle, President of the National Atomic Energy Commission (CNEA), outlined the organisation's five key targets for the coming year: reaching criticality at the RA-10 plant; beginning the refurbishment of the Heavy Water Industrial Plant (PIAP); restarting uranium mining; launching the Argentine Proton Therapy Center; and resuming uranium enrichment to complete the nuclear fuel cycle.

He said: "We have a National Atomic Energy Commission that, through technological development and human resource training, has provided the platform for the emergence of nuclear sector companies that today compete globally, export, create jobs, and offer services in Argentina. This is a true success of state policy." Reidel, a chief adviser to Argentina's President Javier Milei, told La Nacion last week that the aim was for Argentina to be the first country, or among the first, to be commercially selling SMRs. He said that the National Nuclear Plan aimed to accelerate the development of the ACR-300, developed by INVAP with private capital, and "aims to have the four modules operational within five years".

He has also suggested that the SMRs could be sold with a commitment to purchase Argentine uranium, saying in a March interview with Infobae that it was "crazy" for the country to be importing uranium for its existing reactors despite having substantial reserves. The anniversary ceremony was broadcast across all CNEA's centres. The commission, created in 1950, says its mission "is to consolidate Argentina's position as a leading

nation in the peaceful and safe use of nuclear energy, having been committed to scientific and technological development since its inception".

The Background: Argentina currently has three operable nuclear power units - Atucha 1, connected in 1974, Atucha 2, which was connected in 2014 and Embalse which was connected to the grid in 1983. Between them they generate about 5% of the country's electricity. There had been plans for a fourth unit, as Atucha III, but it appears that has been superceded by the SMR plans. Argentina has already had an SMR in development: the CAREM SMR - the name comes from Central Argentina de Elementos Modulares – is a 32 MWe prototype and is Argentina's first domestically designed and developed nuclear power unit. First concrete was poured in 2014, but construction has since been suspended a number of times. It is currently estimated to be about two-thirds complete. With reports of funding uncertainty, a Critical Design Review was ordered for it in May last year.

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Source: https://world-nuclear-news.org/articles/argentina-sets-out-smr-and-uranium-plans, 06 June 2025.

NUCLEAR SECURITY

GHANA

Ghana Reviews Nuclear Security Plan to Strengthen Safeguards

Ghana has commenced a high-level review of its Integrated Nuclear Security Sustainability Plan (INSSP) to strengthen national measures against emerging threats, including terrorism and cyber-attacks, safeguarding nuclear materials, facilities, and technologies. The INSSP, covering the period 2025-2028, is being developed based on identified areas for improvement and national priorities. Speaking at the meeting in Accra, Mr. Kwamena Essilfie Quaison, Director for Science, Technology and Innovation, Ministry of Environment, Science, and Technology (MEST), described the review as crucial, given the current complex security landscape.

"The peaceful use of nuclear science and technology continues to expand, offering enormous benefits in medicine, energy, agriculture, and research. However, this growth also demands enhanced vigilance," he stated. The meeting brought together nuclear security experts from Ghana, Nigeria, Egypt, the United States, and the IAEA to engage in technical discussions, practical exercises, and policy dialogues. Mr. Quaison emphasised that nuclear terrorism and cyber threats to critical infrastructure require "urgent and coordinated attention", adding that the INSSP provides a framework to detect, deter, and respond to nuclear security risks.

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He commended the IAEA, facilitators, the Nuclear Security Department at the Nuclear Regulatory Authority (NRA), and the Ghana Nuclear Security Committee for their collaborative efforts in advancing nuclear security. Professor Francis Otoo, Acting Director-General of the Nuclear Regulatory Authority (NRA), underscored the need

for robust security measures as Ghana progressed towards integrating nuclear power into its energy mix. "The fast expansion of cyber threats, combined with our increasing reliance on digital infrastructure, makes nuclear facilities vulnerable to attacks. Security must be prioritised alongside development," he said.

... "This week's discussions will shape not only Ghana's nuclear security policy but also practices that protect the region and future generations," he concluded. Mr. Zephirin Athanase Ouedraogo, an expert with the IAEA, described the Integrated Nuclear Security Support Plan (INSSP) as the primary mechanism for IAEA cooperation with states, aimed at strengthening national nuclear security regimes. ...Mr. Ouedrago hinted at a workshop in August to assess Ghana's nuclear security architecture. "Drafting this INSSP implementation plan will be a noteworthy milestone for Ghana, which we plan on accomplishing by the end of our meeting. We encourage Ghana to remain steadfast in its efforts to strengthen its nuclear security regime and to continue working with the IAEA," he added.

Source: https://www.ghanabusinessnews.com/2025/06/10/ghana-reviews-nuclear-security-plan-to-strengthen-safeguards/, 10 June 2025.

Nation-building" infrastructure projects discussed by the premiers included critical minerals projects, "the next stage of nuclear, from uranium, to SMRs, to large-scale nuclear", and infrastructure investments including ports, and roads, Carney told a news conference at the conclusion of the meeting. "The point is to build the certainty, the stability and the ambition that builders need to catalyse enormous investment: investment to make Canada into an energy superpower and to build the strongest economy in the G7," he said.

NUCLEAR SAFETY

EL SALVADOR

IAEA Completes First Safety Review of El Salvador's Nuclear Power Plant Plans

El Salvador has taken a significant step toward diversifying its energy portfolio with the conclusion of a six-day safety review by the IAEA on the country's site selection process for its first-ever nuclear power plant (NPP). The review, conducted under the IAEA's Site and External Events Design Review Service (SEED), marks a milestone for the Central American nation as it pursues nuclear energy to meet growing electricity demands and support sustainable economic growth.

Held from May 26 to 31, 2025, the SEED mission was conducted at the request of the Government of El Salvador. It was hosted jointly by the Organization for the Implementation of the Nuclear Energy Program in El Salvador (OIPEN) and the Executive Hydroelectric Commission of the Lempa River (CEL)—the agencies leading the country's nuclear energy initiative.

A New Chapter in El Salvador's Energy Landscape: With El Salvador aiming to diversify its power generation beyond hydropower, fossil fuels, and intermittent renewables, nuclear power is emerging as a clean, reliable, and long-term solution. By adopting nuclear energy, the country hopes to reduce its carbon emissions, stabilize electricity prices, and enhance energy security. "El Salvador's decision to pursue nuclear power is a forward-looking move that aligns with global efforts to transition to low-carbon energy systems," said Daniel Alvarez, President of CEL and Honorary Director of OIPEN. "From the beginning, we have committed to a technical, transparent, and responsible process guided by the highest international standards."

Comprehensive Site Selection Process: The SEED review team, composed of international experts from Japan, the United Kingdom, and the United States, along with two IAEA staff members, assessed El Salvador's site selection process against IAEA guidance and international best practices. The review focused on how effectively the country is integrating geospatial analysis, national regulations, public infrastructure, and exclusion criteria to identify safe and viable locations for its future nuclear facility. Two

candidate sites—Chalatenango, approximately 40 kilometers northeast of San Salvador, and San Vicente, around 70 kilometers east—were visited during the mission for on-site observation and validation of preliminary assessments. The IAEA team reviewed critical documentation, including the site selection report, site screening methodology, siting criteria, and hazard analysis data. According to Kazuyuki Nagasawa, the SEED mission team leader and Senior Nuclear Safety Officer at the IAEA, "CEL independently developed exclusion criteria to identify low-risk areas, which is a commendable approach to minimize external hazards early in the site selection process."

The SEED mission team provided several recommendations aimed at optimizing the site selection methodology. These recommendations emphasized the importance of balancing geological and environmental risks with technical design specifications and administrative safeguards from the earliest stages of the planning process. The goal is to prevent delays or rejections during later project stages.

Capacity Building and Future Steps: As part of the review mission, the IAEA also organized a SEED Capacity Building Workshop to help national experts strengthen their understanding of site evaluation processes. Discussions centered on site characterization—the next phase in the nuclear project development pipeline—and included guidance on how to assess hazards such as seismic activity, flooding, and volcanic threats. The SEED mission team provided several recommendations aimed at optimizing the site selection methodology. These recommendations emphasized the importance of balancing geological and environmental risks with technical design specifications and administrative safeguards from the earliest stages of the planning process. The goal is to prevent delays or rejections during later project stages.

OIPEN and CEL are expected to continue working closely with the IAEA as they advance toward site characterization, in accordance with the IAEA's Specific Safety Guide on Site Survey and Site Selection for Nuclear Installations, as well as additional safety guides related to external hazard assessment. The final SEED mission report will be submitted to the Government of El Salvador within three months, providing detailed feedback and strategic recommendations to guide the next steps in the nuclear project.

About SEED Missions: ... For El Salvador, this SEED mission represents the first-ever formal review of its nuclear energy plans and signals a growing commitment to aligning national infrastructure development with internationally recognized safety and sustainability standards. As global demand for clean energy grows and the urgency of climate action accelerates, El Salvador's nuclear ambitions may not only reshape its domestic energy future but also position the country as a regional leader in sustainable power generation.

Source: https://www.devdiscourse.com/article/science-environment/3445059-iaea-completes-first-safety-review-of-el-salvadors-nuclear-power-plant-plans, 03 June 2025.

NUCLEAR COOPERATION

ARMENIA–USA

Armenia and US Discuss Cooperation in the Field of Peaceful Nuclear Energy and Mining

Armenian Minister of Territorial Administration and Infrastructure David Khudatyan received a delegation from the US Department of Energy led by Deputy Assistant Secretary of State for International Nuclear Policy Aleshia Duncan. US Ambassador to Armenia Christina Kvien was also present. ...

The minister highly appreciated the cooperation with the American side in the field of nuclear energy. "The parties mutually expressed their readiness to further deepen cooperation and discussed a number of issues of cooperation with the US in the energy sector, including in the field of peaceful nuclear energy," Khudatyan noted. The US Embassy in Yerevan reported that Ambassador

Quinn and Deputy Assistant Secretary Duncan discussed Armenian-American cooperation in the nuclear energy and mining industries at a meeting with Khudatyan. Earlier, a new state-of-the-art full-scale simulator (FSS) worth $3.4 million was launched at the Armenian Nuclear Power Plant with the assistance of the United States.

About the Armenian Nuclear Power Plant: The Armenian Nuclear Power Plant, the only one in the South Caucasus region, is located near the city of Metsamor, approximately 30 km west of Yerevan. The plant is one of the main sources of electricity in the country, providing up to 40% of the total output. Its service life has been extended until 2026, and work is underway to re-extend it for another 10 years. It is planned to build a new NPP within 8-10 years, and various options are currently being compared and the experience of partners from Russia, the United States, and South Korea is being studied. The Armenian side is already considering a preliminary feasibility study for the construction of a new 1200 MW unit developed by the Rosatom state corporation. Earlier, Rosatom First Deputy Director General Kirill Komarov, answering a question from the ARKA agency, said that the corporation could offer Armenia nuclear reactors with a capacity of 50 to 1000 MW. According to him, there is, in particular, the possibility of "assembling" a reactor of any capacity from 50 MW units.

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Source: https://arka.am/en/news/economy/armenia-and-us-discuss-cooperation-in-the-field-of-peaceful-nuclear-energy-and-mining/, 05 June 2025.

NUCLEAR PROLIFERATION

IRAN

Iran Warns European Nations Over Move to Censure it for Nuclear 'Non-Compliance'

Iran's Foreign Minister warned the UK, France and Germany on Friday against backing a resolution censuring Tehran at a meeting of the International Atomic Energy Agency next week, saying such a move would be a "strategic mistake". "Instead of engaging in good faith, the E3 is opting for malign action against Iran at the IAEA Board of Governors," Abbas Araghchi said in a post on X. "Mark my words as Europe ponders another major strategic mistake: Iran will react strongly against any violation of its rights."

Mr Araghchi's warning comes as the three European nations prepare to join the United States in backing a draft resolution to censure Iran at next week's board meeting, a diplomatic source told AFP. The resolution would accuse Iran of failing to meet its obligations as a signatory of the NPT and carries the threat of referral to the UN Security Council if Tehran "does not show goodwill", the source added. The move follows a quarterly report from the IAEA last week which cited a "general lack of co-

The UN's nuclear watchdog also expressed "serious concern" that Iran had stepped up its enrichment of uranium to near weapons-grade level in recent months. The report said Iran had an estimated 408.6 kilograms of uranium enriched up to 60 per cent as of May 17, up by 133.8kg since the last report in February. According to the IAEA, Iran is the only non-nuclear weapon state to enrich uranium to 60 per cent, which is close to the roughly 90 per cent level needed for atomic weapons. Iran has repeatedly denied that it is seeking to develop nuclear weapons.

operation" from Iran and raised concerns over undeclared nuclear material.

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Tehran rejected the report as politically motivated and based on "forged documents" that it said had been provided by its arch foe Israel. In his post on X, Mr Araghchi said that despite "years of good co-operation with the IAEA – resulting in a resolution which shut down malign claims of a 'possible military dimension' (PMD) to Iran's peaceful nuclear programme – my country is once again accused of 'non-compliance'. Falsely accusing Iran of violating safeguards – based on shoddy and politicised reporting – is clearly designed to produce a crisis," he said.

The pressure on Iran comes as it holds indirect talks with the US, mediated by Oman, to reach an agreement that would see Tehran accept curbs on its nuclear activity in return for the lifting of economic sanctions imposed by Washington. The two sides have held five rounds of talks since April 12 but are at odds over the issue of uranium enrichment, which produces fuel for nuclear reactors or, at higher levels of purity, material for nuclear warheads. Iran's leaders say that it has the right to enrich uranium under the nuclear Non-Proliferation Treaty and that the issue is "non-negotiable", while President Donald Trump insists that US will not allow enrichment to continue on Iranian soil.

Tehran and Washington are seeking a new agreement to replace a 2015 deal with major powers which Mr Trump unilaterally abandoned during his first term in 2018. The agreement quickly unravelled as Mr Trump reimposed sweeping sanctions on Iran, leading Tehran to begin breaching commitments it made under the pact including a 3.67 per cent cap on the level of its uranium enrichment. Britain, France and Germany, which were all party to the 2015 deal, are now considering whether to trigger a "snapback" of UN sanctions under its dispute resolution mechanism – an option that expires on the deal's 10th anniversary in October.

Source: https://www.thenationalnews.com/news/mena/2025/06/06/iran-warns-european-nations-over-move-to-censure-it-for-nuclear-non-compliance/, 06 June 2025.

Trump Says Iran 'Slowwalking' as Khamenei Opposes Nuclear Proposal

The longtime foes have held five rounds of talks since April to thrash out a new accord to replace the deal with major powers that Trump abandoned during his first term in 2018, but sharp differences remain over whether Tehran can continue to enrich uranium. On Saturday, Iran said it had received "elements" of the US proposal through Omani mediators, the details of which have not been publicly disclosed. "The proposal presented by the Americans is 100 percent against" notions of independence and self-reliance, Khamenei said in a televised speech, invoking ideals of the 1979 Islamic revolution. Independence means not waiting for the green light from America and the likes of America."

Iran's enrichment of uranium has emerged as a major point of contention. Trump said on Monday his administration would not allow "any" enrichment, despite Tehran's insistence it is its right under the nuclear non-proliferation treaty. In a post on Truth Social on Wednesday, Trump

said he spoke with Russian President Vladimir Putin who "suggested that he will participate in the discussions with Iran. It is my opinion that Iran has been slowwalking their decision on this very important matter, and we will need a definitive answer in a very short period of time!" Trump said.

Low-level Enrichment: Khamenei said enrichment is "key" to Iran's nuclear programme and that the United States "cannot have a say" on the issue. "If we have 100 nuclear power plants but don't have enrichment, they will be of no use to us," because "nuclear power plants need fuel" to operate, he said. *The New York Times* reported that the US proposal includes "an arrangement that would allow Iran to continue enriching uranium at low levels" as the US and other countries "work out a more detailed plan intended to block Iran's path to a nuclear weapon". It said the proposal would see the United States facilitating "the building of nuclear power plants for Iran and negotiate the construction of enrichment facilities managed by a consortium of regional countries".

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Iran has previously said it is open to temporary limits on its enrichment of uranium, and is willing to consider the establishment of a regional nuclear fuel consortium. But it has stressed that such a consortium is "in no way intended to replace Iran's own uranium enrichment programme". Iran's chief negotiator, Foreign Minister Abbas Araghchi, said in a post on X: No enrichment, no deal. No nuclear weapons, we have a deal." Iran currently enriches uranium to 60 percent, far above the 3.67-percent limit set in the 2015 deal but still short of the 90 percent threshold needed for a nuclear warhead.

'Less than Satisfactory': The UN nuclear watchdog, the IAEA, said in its latest quarterly report that Iran had further stepped up its production of highly enriched uranium. In a separate report, it also criticised "less than satisfactory" cooperation from Tehran, particularly in explaining past cases of nuclear material found at undeclared sites. The reports came ahead of a planned IAEA Board of Governors meeting in Vienna later this month which will review Iran's nuclear activities. Washington and other Western governments have continued to accuse Iran of seeking a nuclear weapons capability. Iran insists its programme is for peaceful purposes only.

The 2015 deal provided Iran with relief from international sanctions in return for UN-monitored restrictions on its nuclear activities. Trump reimposed US sanctions when he quit the agreement in 2018 and has since tightened them with secondary sanctions against third parties who violate them. Britain, France and Germany, the three European countries who were party to the 2015 deal, are currently weighing whether to trigger the sanctions "snapback" mechanism in the accord. The mechanism would reinstate UN sanctions in response to Iranian non-compliance — an option that expires in October. Iran has criticised the IAEA report as unbalanced, saying it relied on "forged documents" provided by its arch foe Israel.

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Source: https://www.rfi.fr/en/international-news/20250604-iran-s-khamenei-says-us-nuclear-

proposal-against-national-interest, 04 June 2025.

URANIUM PRODUCTION

GENERAL

Meta, Constellation Power Deal may Help Uranium Miners

Facebook owner Meta's 20-year deal with Constellation Energy (Nasdaq: CEG) to buy output from its Clinton nuclear plant in central Illinois bolsters the long-term case for uranium producers, analysts said. Starting in June 2027, Meta is to receive about 1.12 gigawatts from Constellation, which represents the entire output from Clinton's reactor, the companies said late Tuesday in separate statements. Future modifications will boost Clinton's output by 30 megawatts, they also said. The plant's current capacity is enough to power about 1 million homes.

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Meta's decision to sign with Constellation "is indicative of not only the need for power, but the desire of these hyperscalers to get that power from renewable sources," GLJ Research founder and CEO Gordon Johnson said Wednesday in a telephone interview from New York. "The demand for nuclear is real, evidenced by Meta, the lack of supply is real, and the shortage of supply is going to get worse as these data centres start to ramp up and need power." Tech companies such as Meta need vast amounts of energy to operate their data centres and artificial intelligence applications. Nuclear energy is especially prized because it's available around the clock and doesn't emit planet-warming air pollution, Red Cloud Securities analysts said Wednesday in a note.

Hyperscaler Support: The announcement represents "another supportive move from the hyperscalers for nuclear generation in the US," BMO Capital Markets mining analysts Helen Amos and George Heppel wrote in a note. Meta is buying the energy as part of a commitment to source all of its electricity from clean and renewable power. After announcing last year that it would seek proposals for up to 4 gigawatts of US nuclear capacity, the company said Tuesday it's in final discussions with a shortlist of potential projects to meet its target.

Demand, Price Trends: Tech companies' drive to build additional data centres intersects with a few inter-industry trends. For one, demand for uranium is projected to triple by 2040, underscoring the urgent need to develop mines. Uranium demand already outstrips production by 50 million to 60 million lb. a year, according to World Nuclear Association data. "There is a new industrial revolution going on right now," Johnson said. "There's an explosion in energy demand associated with data centres that people think are going to be needed to power AI. You need real solutions, and the only real solution in renewables is nuclear. If you're a nuclear bull, the set-up couldn't be better."

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Another trend is spot uranium prices, which for now remain relatively low by historical standards. Spot uranium has dropped about 20% in the past

year to $71.90 per lb. as of Wednesday afternoon, well below the all-time high of $136 per lb. in 2007, but still higher than it was in the decade after the Fukushima disaster. Lower prices for the nuclear metal discourage investment and make mining less profitable.

Building Domestic Supply: To be sure, several uranium mine projects in the US are already in the works. Australia's Laramide Resources (TSX: LAM) said this week that its Crownpoint-Churchrock and La Jara Mesa uranium projects have been granted FAST-41 Covered project status by the US Permitting Council. This clears the way for faster permitting and increased government support. Last month, the United States Department of the Interior approved Anfield Energy's (TSXV: AEC; US-OTC: ANLDF) Velvet-Wood uranium and vanadium mine in Utah, making it the first project to be greenlit under a compressed 14-day environmental review timeline.

But while the US works to secure domestic supplies of uranium, the reality is it depends on imports for most of its uranium needs, according to the US Energy Information Administration (EIA). Of the uranium oxide the US purchases, 57% comes from Kazakhstan, Uzbekistan, Australia and Russia, and 27% comes from Canada, EIA data shows.

Now that the final environmental assessment has been completed by the Bureau of Land Management, Anfield Energy has the necessary approval to restart the old Velvet mine and develop the nearby Wood deposit, the Department of the Interior said May 23. But while the US works to secure domestic supplies of uranium, the reality is it depends on imports for most of its uranium needs, according to the US Energy Information Administration (EIA). Of the uranium oxide the US purchases, 57% comes from Kazakhstan, Uzbekistan, Australia and Russia, and 27% comes from Canada, EIA data shows.

Nuclear Leveling Up: In the meantime, several nuclear reactor operators are trying to boost capacity. With the guarantee that Clinton can run for two more decades, Constellation said it's evaluating strategies to extend the plant's existing early site permit or seek a new construction permit from the Nuclear Regulatory Commission to pursue development of an advanced nuclear reactor or small modular reactor at the site. Known as the Clinton Clean Energy Center, the facility was initially slated for closure in 2017 after years of financial losses. Illinois lawmakers prevented the retirement by setting up a Zero Emission Credit program that supports the plant through mid-2027. "Securing clean, reliable energy is necessary to continue advancing our AI ambitions," Urvi Parekh, Meta's head of global energy, said in the statement. "We are proud to help keep the Clinton plant operating for years to come and demonstrate that this plant is an important piece to strengthening American leadership in energy."

Long-term support is needed for many nuclear plants in the US to ensure electricity grids remain reliable while energy needs grow, it said. "Keeping an existing plant operating will have the same positive effect as adding new clean energy to the grid, and avoid the disruption that has occurred when other nuclear units have retired prematurely.

Quick Advance: As it seeks additional power, Meta said it's prioritizing sites "where nuclear development can be advanced quickly with high degrees of certainty on execution and timeline." Existing nuclear plants "will not be able to stay online indefinitely without partners and investments that help extend existing operating licenses and increase generation capacity," the tech company added. Long-term support is needed for many nuclear plants in the US to ensure electricity grids remain reliable while energy needs grow, it said. "Keeping an existing plant operating will have the same positive effect as adding new clean energy to the grid, and avoid the disruption that has occurred when other nuclear units have retired prematurely."

Source: https://www.mining.com/meta-constellation-power-deal-may-help-uranium-miners-analysts/, 05 June 2025.

NUCLEAR WASTE-MANAGEMENT

UK

UK Parliament Committee Calls for Speedier Sellafield Clean-up

The estimated GBP136 billion (USD184 billion) cost of decommissioning the Sellafield nuclear site in Cumbria would increase even more should work be further delayed, the UK House of Commons Public Accounts Committee has warned. It says not enough progress has been made in addressing the project's most significant hazards. The Sellafield site - which houses more than 1000 buildings - is the largest nuclear complex in Western Europe. Sellafield's nuclear facilities include those connected with the Magnox reprocessing programme, the Sellafield mixed-oxide fuel plant, the Thermal Oxide Reprocessing Plant, and nuclear waste treatment plants. It is also home to redundant facilities from defence work in the 1950s, which included making plutonium for nuclear weapons.

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The Nuclear Decommissioning Authority (NDA) expects full site remediation at Sellafield will take until 2125, while the forecast cost of decommissioning the site has risen to GBP136 billion (USD176 billion). The NDA spent GBP2.7 billion at Sellafield in 2023-24, while the site earned GBP0.8 billion in income in the same year. The Public Accounts Committee's report finds that Sellafield Ltd has missed most of its annual targets for retrieving waste from several buildings on the site, including the Magnox Swarf Storage Silo (MSSS). The committee's inquiry heard that the MSSS is the most hazardous building in the UK, and "as a result of Sellafield Ltd's underperformance will likely remain extremely hazardous for longer". The report seeks answers from government on how it will hold the NDA and Sellafield Ltd to account in mitigating the site's greatest hazards.

"Sellafield Ltd's performance in delivering major projects (such as new buildings to store waste or make it safe) has historically been very poor, with large cost increases and delays occurring all too frequently," the report says. "There are signs of improvement – however given Sellafield's track record, we are yet to be fully convinced that this is not another false dawn." The Public Accounts Committee warns of the impact that delays in the programme have on costs. In the long-term, waste will need to be stored in an underground Geological Disposal Facility (GDF). The committee finds that the date for the GDF has slipped from 2040 to the late 2050s, with every decade of delay meaning Sellafield could need to construct another storage building, each costing GBP500-760 million.

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The Public Accounts Committee says the Department for Energy Security and Net Zero (DESNZ) "needs to do more to ensure that the site is decommissioned in a way that represents value for money for the taxpayer". It says the estimated cost of decommissioning the site will rise "if work is deferred for short term affordability reasons, or if the GDF is delayed. Conversely, there may be opportunities to reduce the cost of decommissioning Sellafield and the other NDA

sites". The committee said DESNZ also "needs to make sure that Sellafield Ltd and the NDA are implementing a corporate culture in which all staff feel safe and confident to speak up, particularly given the safety critical nature of the industry".

"As with the fight against climate change, the sheer scale of the hundred-year timeframe of the decommissioning project makes it hard to grasp the immediacy of safety hazards and cost overruns that delays can have," said Sir Geoffrey Clifton-Brown, Chair of the committee. "Every day at Sellafield is a race against time to complete works before buildings reach the end of their life. Our report contains too many signs that this is a race that Sellafield risks losing. …The Public Accounts Committee examines the value for money of government projects, programmes and service delivery. Drawing on the work of the National Audit Office, the committee holds government officials to account for the economy, efficiency and effectiveness of public spending.

NDA Group CEO David Peattie Said: "We welcome the scrutiny of the committee and their report; we will now look in more detail at the recommendations and consider how best to address them. We take the findings seriously and the safety of the site and the wellbeing of our people will always be our highest priorities. As the Committee has noted, Sellafield is the most complex and challenging nuclear site in the UK. We are pleased they recognise improvements in delivering major projects and that we are safely retrieving waste from all four highest hazard facilities. …

Source: https://world-nuclear-news.org/articles/uk-parliament-committee-calls-for-speedier-sellafield-clean-up, 05 June 2025.

USA

Idaho Researchers Collaborate with US Company to Develop Novel Nuclear Fuel to Preserve, Improve Today's Reactors

Father and son entrepreneurs Mehul and Milan Shah have patented a new nuclear fuel design that could reduce nuclear waste, enhance safety and lower costs for today's pressurized heavy water reactors. The Shahs — CEO and chief operating officer, respectively, of Clean Core Thorium Energy, along with chief technology officer Paul Chan — combined thorium with high-assay low enriched uranium, which is enriched to between 5% and 20%.

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Called Advanced Nuclear Energy for Enriched Life (ANEEL), the Shah's fuel design could operate in pressurized heavy-water reactors worldwide. But before ANEEL fuel can enter the marketplace, the Shahs must prove its performance and safety to industry and regulators.

Unparalleled Capabilities and Expertise: After a few years searching for the right research facility, the Shahs connected with researchers at the Idaho National Laboratory (INL), one of the few places in the world with the expertise and capabilities to properly qualify their design at an accelerated rate.

INL and other national laboratories make their resources available to private companies to foster innovation in the energy industry. Without national laboratories, private companies could not create these essential capabilities on their own. This is especially true for the nuclear industry, and

Clean Core is just one of many companies INL supports in nuclear fuel development.

In particular, the Shahs wanted the high neutron flux and high burnup offered by INL's Advanced Test Reactor (ATR) and the "crash test" capabilities offered by the Transient Test Reactor. ...In spring of 2024, ATR engineers placed 216 ANEEL fuel pellets in ATR's special clover leaf-shaped reactor core. After four months of irradiation time, the first batch of fuel pellets is ready for examination. The remaining pellets will stay in ATR through spring of 2026 so researchers can study how higher burnup affects the fuel. For the Shahs, this is the moment of truth. The data gathered through the efforts of INL experts will help prove the ANEEL concept for regulators and investors.

A National Lab, University and Private Collaboration: Post-irradiation examination of the ANEEL fuel marks the culmination of a years-long collaboration among INL, Clean Core and Texas A&M University. While most private companies conducting nuclear fuel research receive some kind of government funding to help pay for their projects at INL, Clean Core's irradiation testing at ATR is all privately funded.

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INL sent uranium oxide to Texas A&M researchers, who mixed it with commercially sourced thorium oxide in a proprietary blend and fabricated the fuel pellets under INL's Quality Assurance program. Unlike conventional fuel pellets, the ANEEL fuel is annular, which means it's fabricated with a hole in the center of the pellet to better accommodate fission gas release at high burnup. The fuel pellets were then sent back to INL for quality control, assembly into the fuel capsule and insertion into ATR.

... Researchers divided the 216 fuel pellets that Texas A&M made for the ATR experiments into 12 capsules. They then divided the capsules into three "baskets" for insertion into the ATR core. The 12 capsules have different blends of uranium and thorium, including one capsule with pure uranium oxide as a control. Each basket undergoes a different level of burnup — the amount of time spent being bombarded with neutrons in the ATR reactor core. The first basket was removed from the core in November 2024, achieving a fuel burnup of up to 25 gigawatt days per ton. After four months in ATR's cooling pool and shipment from ATR to MFC, the fuel was ready for examination by mid-March 2025.

Post Irradiation Examination: Like similar fuel irradiation efforts for private companies, Clean Core's post-irradiation examination starts at the Hot Fuels Examination Facility, the nation's largest and best-equipped hot cell for processing and examining irradiated nuclear materials and fuels. After arrival at the facility, one step in the post-irradiation examination process is to perform neutron radiography on the fuel to evaluate the fuel's physical changes during irradiation. These early results indicate good structural integrity and irradiation stability for Clean Core's ANEEL fuel. ...

Following radiography, the fuel will undergo several more non-destructive exams, including a visual examination; profilometry, which measures the rod's surface looking for physical dimensional changes; and detailed gamma scanning, which looks for fission-product distribution in the fuel. Finally, the fuel rodlets will be disassembled so the fuel pellets can be inspected. Because the fuel rodlets must be cut open to access the fuel pellets, these types of exams are known as destructive examinations. Destructive examinations will include collecting fission gasses within the fuel pin and using microscopy on individual fuel pellets to examine the effect

that irradiation has on the fuel's microstructure.

Establishing U.S. Leadership: These collaborations between private companies and INL help industry power the reactors of the future. ... INL plays an essential role in meeting these goals. Combined, the lab's one-of-a-kind manufacturing, irradiation and post-irradiation examination capabilities mean companies can prove their fuels with confidence in the resulting data. ...

Source: https://inl.gov/idaho-researchers-collaborate-with-u-s-company-to-develop-novel-nuclear-fuel-to-preserve-improve-todays-reactors/?__cf_chl_f_tk=t E7tnx HBPb 5IFKXGBZf7A4AMb EuboOu8gQSUiV. ubUA-1750056287-1.0.1.1-y7Giw NBw82CL 54Y aGvgx2hvkWDUrte5 MMPah1SF9dXg, 12 June 2025.

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