



OPINION – Manpreet Sethi

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25 Years After it was Drafted, Why India’s Nuclear Doctrine Still Remains Relevant

Within 15 months of its nuclear tests – Pokhran II — India was ready with a draft nuclear doctrine. On August 17, 1999, KSubrahmanyam, convenor of the first National Security Advisory Board (NSAB), a subsidiary body of the National Security Council, presented the document to Brajesh Mishra, the country’s first National Security Advisor. The document was made public so that the doctrine would, as then Prime Minister Vajpayee stressed, “be properly studied before it attains finality”. The draft doctrine did not receive the official stamp. However, the principles mentioned in it were reproduced in a press note that the government released after the doctrine was operationalised in 2003.

The draft nuclear doctrine transparently presented India’s conceptualisation of its role as a nuclear weapons state. It unambiguously declared a political role for nuclear weapons, directed the building of credible deterrence at the minimum level, and for a retaliation-only policy. These principles reflected sobriety and restraint and have since directed the structure of India’s nuclear force and its posture.

However, these principles were conceived 25 years ago. Has not the nuclear threat landscape

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changed since then? Closer home, Pakistan routinely resorts to shrilly projections of its “full spectrum deterrence” for first use. China appears to be undertaking an unprecedented expansion of its nuclear numbers and capabilities. Do these changes necessitate a

revision of the guidelines adopted a quarter century ago?

Pakistan’s use of cross-border terror and China’s increasingly aggressive behaviour are certainly the two topmost security threats India faces. There is also the additional fear of the two countries coming together against India. Can

India's arsenal deter two nuclear-armed adversaries without a substantive accretion? Should India stick with the doctrine of credible minimum deterrence?

While India has abjured large-scale accumulation of nuclear warheads or the need to match those of the adversary, the draft doctrine does mandate a nuclear force that would be "effective, enduring, diverse, flexible and responsive". Therefore, the numbers are a dynamic entity related to the strategic environment. India's arsenal is growing at a measured pace every year and there is no need for panic on this front since

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nuclear deterrence is not a numbers game. Some other technological developments merit greater attention instead. These include the adversary's technological advances towards highly accurate conventional delivery systems, the ability to mount cyber attacks on nuclear command and control, the use of AI to neutralise retaliatory capability, and improved intelligence surveillance and reconnaissance (ISR) capability that could make India's nuclear forces more vulnerable to first strike. These developments demand a focus on the survivability of the country's nuclear forces. They do necessitate changes in numbers and command and control structures. However, such capability build-up does not require a change in the nuclear doctrine.

A second doctrinal attribute that often causes debate is no-first-use. This is instinctively dubbed as a reactive strategy that cedes initiative to the adversary. Pakistan's and China's disruptive

behaviour is considered by some as being encouraged by India's lack of a "hard-nosed hawkish" first-use strategy. This argument,

however, does not stand scrutiny. A first-use strategy needs to be supported with a credible striking capability that would obviate, or significantly minimise, retaliation. This, in turn, is contingent on a sophisticated arsenal of highly accurate nuclear delivery systems in large numbers, with good ISR that can locate and target the adversary's nuclear forces. An effective BMD will also be required. None of this will come easy or cheap. A

credible first strike is not only difficult to build, but it will yield little by way of meaningful results against an adversary who has a robust second-strike capability.

The basic attributes of the doctrine as presented in the draft 25 years ago, therefore, remain valid in the face of contemporary nuclear trends. India's nuclear doctrine, in fact, stands out for being a beacon of nuclear stability, even as others are indulging in hedging strategies and an arms race. The calmness of India's doctrine is a virtue amidst today's nuclear cacophony.

Some argue that we should dispense with NFU but not declare first use, thereby staying ambiguous. Such a strategy would only heighten the adversary's sense of insecurity about losing its nuclear arsenal to a possible first use. The fear of an imminent nuclear strike and the pressure to "use or lose" could tempt the adversary to use its nuclear force first.

Ambiguity would increase room for misperception and prove costly in conflict. The draft doctrine has also been criticised for omitting deterrence through the threat of the use of tactical nuclear weapons. Given their purported ability to achieve limited destruction, nuclear weapons are believed to be able to deter better. But the idea of limited destruction and escalation control are mere assumptions. Given the nature of a nuclear

weapon, can there be anything tactical about its use? In fact, even a planned tactical nuclear weapon use could result in a completely unstable situation since the response from the adversary can never be predicted.

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Source: <https://indianexpress.com/article/opinion/columns/25-years-why-indias-nuclear-doctrine-relevant-9518938/>, August 17, 2024.

OPINION – Express Defence

India's Strategic Leap: Commissioning Nuclear-powered Submarine, INS Arighat

India is enhancing its maritime capabilities with the commissioning of its second nuclear-powered ballistic missile submarine (SSBN), INS Arighat. As a vital addition to the SFC, INS Arighat's imminent induction underscores India's growing emphasis on securing its interests in the Indo-Pacific region. "This move places India in a stronger position to deter aggression, particularly from regional powers like China, which has been rapidly expanding its naval presence," says a former Naval officer.

The Strategic Significance of INS Arighat: INS Arighat, India's second indigenously built SSBN, represents a crucial step in the country's strategic maritime expansion. Following the induction of INS Arihant in 2016, Arighat marks a leap forward in technological advancements, offering enhanced capabilities over its predecessor. Equipped with

the indigenous K-15 ballistic missile, capable of striking targets up to 750 kilometers away, INS Arighat is a formidable asset in India's nuclear triad. The submarine's ability to remain submerged for extended periods, coupled with its nuclear propulsion, allows it to serve as an effective second-strike platform, a key component of India's nuclear deterrence strategy.

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The strategic importance of INS Arighat is further amplified by its patrol capabilities in the Indo-Pacific region. As India's geopolitical focus increasingly shifts towards this area, having a second SSBN enhances its deterrence posture against any naval threat. The Indo-Pacific, a region marked by rising tensions and

aggressive posturing, particularly by China, necessitates a robust and credible maritime deterrent. The addition of INS Arighat to India's naval fleet addresses this need by ensuring continuous patrol and deterrence capabilities, crucial for maintaining stability in the region.

Comparative Analysis: India vs. China's Underwater Capabilities: India's commissioning of INS Arighat is also significant when viewed in the context of China's naval capabilities. China currently operates six Jin-class SSBNs, each equipped with JL-2 ballistic missiles with a range of 7,200 kilometers, vastly outstripping the range of India's K-15 missiles. However, while China's numerical superiority is apparent, India's focus on indigenously developing and enhancing its nuclear submarine capabilities demonstrates its long-term commitment to securing its maritime borders and asserting its influence in the Indo-Pacific.

China's rapid naval expansion, including the construction of more advanced SSBNs, is part of its broader strategy to assert dominance in the South China Sea and beyond. For India, the strategic commissioning of INS Arighat and the impending induction of the third SSBN, INS Aridaman, serves as a counterbalance to China's

growing influence. Although India's fleet is smaller, the quality and technological sophistication of its submarines, combined with its strategic location, provide a significant deterrent capability.

Future Prospects and Challenges: INS Arighat's commissioning is not just a milestone for India's naval forces but also a precursor to more significant developments in the country's maritime strategy. The next phase of India's SSBN program involves the construction of even larger submarines capable of carrying ballistic missiles with a range of up to 3,000 kilometers. This expansion will further enhance India's second-strike capability, making it a more formidable player in the Indo-Pacific region.

However, challenges remain. The need for continuous technological advancements, crew training, and maintenance of such sophisticated platforms requires sustained investment and focus. Additionally, as India's naval ambitions grow, so too will the need for robust logistical and support systems to ensure the operational readiness of its SSBN fleet.

Bottomline: The commissioning of INS Arighat is a pivotal moment in India's maritime history, reflecting the country's resolve to secure its interests in an increasingly contested Indo-Pacific region. As India continues to enhance its naval capabilities, particularly in comparison to China, the strategic balance in the region is set to evolve. INS Arighat, with its advanced features and strategic capabilities, is a critical asset that underscores India's commitment

to maintaining peace and stability in the Indo-Pacific.

Source: <https://www.financialexpress.com/business/defence-indias-strategic-leap-commissioning-nuclear-powered-submarine-ins-arighat-3595691/>, August 29, 2024.

OPINION – Jonathan Trexel

Strategic Sufficiency 2.0: Deploying Regional Nuclear Triads

For India, the strategic commissioning of INS Arighat and the impending induction of the third SSBN, INS Aridaman, serves as a counterbalance to China's growing influence. Although India's fleet is smaller, the quality and technological sophistication of its submarines, combined with its strategic location, provide a significant deterrent capability.

Strategic stability as it was once known is on life support. For those unfamiliar with the concept, strategic stability is a condition of strategic power balance that enables deterrence to function more effectively. The obvious goal of deterrence is conflict prevention and the attendant risks of regional and global nuclear escalation. For over 75 years this global deterrence architecture relied on a highly credible American strategic force posture, comprised of strategic and theater nuclear forces and limited homeland missile defenses.

For over 75 years this global deterrence architecture relied on a highly credible American strategic force posture, comprised of strategic and theater nuclear forces and limited homeland missile defenses. Today, the international security environment is anything but stable, certain, and peaceful. And the future is trending in the wrong direction for the United States and its allies. American strategic force posture must be rebalanced. The US needs a policy of strategic sufficiency 2.0 with new regional nuclear triads as its centerpiece.

Today, the international security environment is anything but stable, certain, and peaceful. And the future is trending in the wrong direction for the United States and its allies. American strategic force posture must be rebalanced. The US needs a policy of strategic sufficiency 2.0 with new regional nuclear triads as its centerpiece. Those who favor a rules-based

construct of international relations now face the specter of broad and catastrophic threats from a new axis of authoritarianism. This axis is a political union comprised of authoritarian China, Iran,

North Korea, and Russia, each guilty of intense human rights abuses of their own people. They seek to create a new world order of control, coercion, and, when needed, armed conflict where they reap the benefits. This new political union could include aggression against the US and its allies simultaneously.

Their military prowess is greatly increasing, through a nuclear arms race that the United States is passively observing. Most importantly, this includes theater nuclear forces of short-, medium-, and intermediate-range missiles in the Pacific and Europe. Today, the US simply has no theater range nuclear forces forward-deployed to the Pacific. According to the Congressional Research Service, all American nonstrategic nuclear weapons are either forward-deployed with aircraft in Europe or stored in the United States. Further, with Russia possessing as many as 2,000 nonstrategic nuclear weapons in its arsenal, the US and NATO are outpaced in theater nuclear forces in Europe by perhaps a 10-to-1 margin. Unlike the Cold War, these threats are undergirded by China's economic power, ironically fueled for decades by liberal societies enamored with China's cheap product and labor.

It is meaningless to characterize the American relationship with these regimes as competition. The United States and its allies are in conflict with them, not yet armed conflict, but conflict, nonetheless. The US has four broad policy choices

for its strategic force posture. First, it can stay within guidance of the 2022 Nuclear Posture Review (NPR) and slowly modernize the strategic nuclear triad while reducing reliance on nuclear

weapons hoping adversaries follow. However, every nuclear-armed adversary is deepening reliance on nuclear weapons and expanding nuclear forces, with no signs of stopping.

Second, the US can seek an isolationist foreign policy and aid its allies in developing and deploying their own nuclear capabilities. This option requires that the US all but abandon its policy of extended deterrence and the

Treaty on the NPT, placing regional security in peril and fostering geopolitical atrophy. Third, it can promote new security architectures in Europe and the Pacific, where a leading regional ally would

assume responsibility for providing the needed "nuclear umbrella" over fellow regional allies. This option is likely unworkable.

The fourth option is for the US to embrace its historical leadership role, strengthen its strategic force posture, and, working with Allies, reconstitute regional conventional defenses. The last option is the only prudent one to prevent conflict through deterrence against multiple adversaries for the foreseeable future.

The logic of such a strategy should start with President Richard Nixon's approach. In the late 1960s, Nixon formulated a realist policy of "strategic sufficiency." It was designed to adjust the American strategic force posture to the

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In the late 1960s, Nixon formulated a realist policy of "strategic sufficiency." It was designed to adjust the American strategic force posture to the threats, uncertainties, and instability of that time. Such threats included rapid growth in Soviet nuclear forces and the prospect of simultaneous armed conflict with multiple nuclear-armed adversaries. Nixon concluded strategic balance was essential for overall security, though it meant expanding the American nuclear forces immediately. Quantity was a quality all its own.

threats, uncertainties, and instability of that time. Such threats included rapid growth in Soviet nuclear forces and the prospect of simultaneous armed conflict with multiple nuclear-armed adversaries. Nixon concluded strategic balance was essential for overall security, though it meant expanding the American nuclear forces immediately. Quantity was a quality all its own. If numbers mattered to the Soviets, then the United States needed to include them in sufficiency assessments.

In his first annual foreign policy report to Congress, Nixon argued strategic sufficiency required a military calculation of forces for warfighting, but explicitly argued sufficiency's core idea was

political. Forces could only be sufficient if they accounted for vital and long-term American security interests and aspirations, including the protection of global commercial markets. Combined, the military and political features of Nixon's sufficiency enabled the US strategic force posture to accomplish a wide set of policy goals. These included deterring the Soviets, assuring allies, countering coercion, providing a president political bargaining power to successfully wage an escalatory battle, fight and finish war on multiple fronts, and safeguard long-term interests.

To rebalance the force, the Nixon administration moved to upload nuclear missiles with MIRV to be able to attack more targets and overcome enemy defenses without reliance on a launch-on-warning strategy. Nixon also hardened ICBM silos, increased the mobility of forces, and increased air and missile defenses. Nixon coupled American security to allied security but demanded more of allies especially for conventional forces to deter regional aggression. Such was the logic and choices of Nixon's policy. However, Nixon's sufficiency policy was formed in the 1960s, in an era when large or surprise Soviet nuclear attack was feared. It focused on American strategic nuclear forces that provide central deterrence of

attacks on the homeland. Today, the most likely pathway to nuclear escalation and attacks on the homeland is through regional conflict, where adversaries have a significant and growing theater nuclear advantage, particularly in sub-intercontinental-range missiles. Allies are faced with direct and immediate threats of aggression and nuclear attacks. The United States nuclear

triad of strategic systems is neither designed nor credible for waging regional nuclear war and escalation. It invites nuclear retaliation on the homeland.

Therefore, a strategic sufficiency 2.0 for the future must include nuclear forces necessary to satisfy Nixon's military-political goals, but with a focus on

the theater. Beefing up the American strategic nuclear triad is important, but so is expanding regional conventional forces and homeland defenses. However, the greatest deterrence priority for this new axis of authoritarianism is building American theater nuclear triads. Adversaries calculate the totality of war and the risks of escalation all the way through war termination prior to making the initial decision to wage war. And so, the strategic force posture must have the forces in place to succeed at every step of conventional and nuclear war in order to deter war. Regional nuclear triads plug the greatest force sufficiency gap in this spectrum.

Regional nuclear triads would create a deterrent wall between regional conventional conflict and escalation to strategic nuclear conflict against the homeland. Today, such walls are virtually nonexistent. Regional nuclear triads in Europe and the Pacific would be sufficient to provide the president a wide range of theater options to counter simultaneous axis escalation threats, without having to move forces from one region to the other. Such diverse options enable a president to successfully wage the regional escalation battle without using the strategic triad. To use

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the strategic triad would pointlessly drive central deterrence risks to the homeland.

Regional nuclear triads not only build the critical deterrent wall, but they are also sufficient to accomplish, at the regional level, the full range of Nixon's military and political features noted above (deterrence, assurance, counter-coercion, escalatory bargaining, and war winning). Theater nuclear forces of such strength also hedge against the uncertainties involved in adversary nuclear force projection and intentions in the out years. This reduces regional and homeland risks, and builds the high confidence needed of a strategic sufficiency policy. Regional nuclear triads would have varying ranges and yields for proportionality and credibility and would afford the same force attributes of survivability, responsiveness, and flexibility provided by the strategic triad. This combination of attributes creates the military, political, and psychological effects that maximize adversary doubts and fears of the consequences of undesired actions. Placing regional nuclear triads in Europe and the Pacific achieves this strong regional deterrent effect unlike any other policy option.

This should be achieved in both theaters. For example, the United States can deploy a combination of ground-based nuclear-armed hypersonic weapons and nuclear-armed F-35 aircraft, nuclear sea-launched cruise missiles (the SLCM-N), and air-launched nuclear-armed

hypersonic missiles. Regional nuclear triad means-of-delivery and nuclear weapons must also be of sufficient numerical strength to balance Russian theater nuclear forces in Europe and Chinese/North Korean theater nuclear forces in the Pacific. As mentioned earlier, American strategic force posture must account for military and political force requirements across the spectrum of conflict. Therefore, in addition to regional nuclear triads, strategic sufficiency 2.0 also requires an American strategic force posture to make three other adjustments to deal with threats.

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First, the US must upload its ICBM force with additional nuclear weapons. In keeping with Nixon's uploading policy, the US should use uploaded missiles to keep pace, weapon for weapon, with Chinese strategic nuclear weapon deployments. This achieves the military and political purposes stated earlier, but also demonstrates political resolve toward arms control at some point. Second, the posture must safeguard key elements of the homeland from enemy coercion. Missile defenses reassure the American people, but also enable a president to take the risks necessary to effectively escalate and win a conflict where nuclear use is threatened or takes place. A limited defense against coercive attacks against major American population centers and adversary first-strike weapons against American leadership adds that needed reassurance to the deterrence equation.

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Third, in partnership with allies, the US must restore regional conventional forces to deter axis

aggression. This should include a substantial number of American air-, sea-, and land-based conventional hypersonic missiles capable of defeating, at range, enemy defenses and their anti-access area-denial capabilities. It will also require greater allied burden and risk sharing through increased defense spending, expanding regional combat power and expanding access for American theater nuclear forces. Challenges to a strategic sufficiency 2.0 policy come in several forms. Detractors may make the following arguments. First, some may argue that expansion of American nuclear forces will spark an arms race. Unfortunately, an arms race already exists. The United States is not a participant.

Second, some may argue nuclear expansion is unaffordable. Nuclear forces, including ongoing strategic triad modernization, account for 6 percent of the defense budget and less than 1 percent of federal spending. Regional nuclear triads, uploading, conventional hypersonics, and improved missile defenses are minimal in cost. Deterrence is, however, far less expensive than warfighting.

Third, some may suggest a single nuclear weapon system, such as SLCM-N, is all that is needed for regional deterrence. But this approach leaves out critical military and political features of sufficiency such as attributes, warfighting capabilities, and escalation options that regional nuclear triads offer. Finally, some could argue that the United States can accomplish its military and political objectives if the nation can strike key targets with the strategic nuclear triad. This force sufficiency assumption is a common trap. Nixon argued that while narrow military planning is necessary in helping to discern strategic sufficiency, he warned against “debatable calculations and assumptions regarding possible scenarios.” Rather, sufficiency dealt more with

force capacity in its “broader political sense.” Anything less than full force balance is unacceptable.

The policy of the United States should be to embrace leadership and engagement in the world to resolutely safeguard its national security and that of its allies and partners. To do so, American policy should be to reconstitute strategic force posture, including expanding the strategic nuclear triad through MIRVing ICBMs; establishing theater nuclear triads in Europe and the Pacific; expanding missile defenses; and expanding theater conventional forces. War prevention is the object of deterrence, a strategy that has worked for over

75 years. Deterrence, strategic stability, and nonproliferation were always the strongest when the US and its allies were strong. Power is the language respected by authoritarians, and the US should not be afraid to wield it. Strategic sufficiency 2.0, with an emphasis on regional nuclear triads, can rebalance the American strategic force posture and

create the conditions of strategic stability and deterrence effectiveness against the multipolar axis threat.

Source: <https://globalsecurityreview.com/strategic-sufficiency-2-0-deploying-regional-nuclear-triads/>, August 15, 2024.

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OPINION – Peter Huessy

What is the Cost of a Modernized Nuclear Deterrent?

The assessment of the how much the United States should pay for nuclear deterrence involves looking at both the legacy nuclear systems America maintains and the replacement or modernized platforms and warheads scheduled for acquisition. On top of which operating and maintaining a nuclear force is also part of the cost and this includes security forces, operating crews, and the bases from which the US forces are deployed. In

addition, the National Nuclear Security Administration builds and maintains the thousands of nuclear weapons deployed and on alert as well as in the hedge stockpile of weapons that could be added to the nuclear force if needed.

A number of organizations publish such studies and have concluded that over the next three decades, the United States plans to spend as much as \$1.7 trillion on nuclear deterrence and an average of \$75 billion a year for the next decade. These numbers further give the impression that the US is planning to spend far more than is affordable and with smart choices can significantly reduce such costs as well as show some restraint in securing nuclear deterrence, a restraint that will also lead China and Russia to limit their already undertaken nuclear buildups.

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In addition, the National Nuclear Security Administration builds and maintains the thousands of nuclear weapons deployed and on alert as well as in the hedge stockpile of weapons that could be added to the nuclear force if needed. The current legacy systems of the MIII ICBMs, the B52 and B2 strategic bombers, and the Ohio class submarines have been in or will be in the US force when they are retired some 42-70 years. It is remarkable that the Navy and Air Force and the supporting aerospace industries have engaged in truly heroic efforts to keep these forces at the ready for ongoing deterrence, especially given the growing difficulty of sustaining systems that are

not just decades beyond their certified life-cycle but becoming increasingly costly to sustain.

The current RDT&E and Acquisition budget request for new ICBMs, new submarines and submarine launched missiles, and the portion of the new strategic bombers that are designated for the nuclear force, plus a rough estimate for the costs of nuclear, control and communication, comes to under \$19 billion annually. And over 30 years hardly reaches the highly exaggerated \$1.7 trillion often used by nuclear abolitionists. As a number

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of senior military officials have explained, if we do not sustain these legacy forces we are out of the nuclear business. But the ability of keeping the legacy forces for much longer is in serious question and thus as Admiral Richard and General Mattis and others have explained we have two choices. First, sustain the legacy systems as long as possible but forgo

modernization and in the process disarm over time and get out of the nuclear deterrent business. Or second, modernize and stay in the nuclear business with the added cost of the new platforms, not the cost of the operations and maintenance we are already spending.

Forgoing modernization is thus not in the cards unless one is willing to unilaterally disarm. Some analysts do not even think that is a problem they have also concluded US conventional military capability is of such a magnitude that nuclear weapons are no longer needed. However, in their zeal to cut nuclear expenditures, most nuclear program cost estimates include current operations and maintenance and personnel for the current legacy forces. However, these costs are a given and cannot be considered part of any new "modernization effort. That is part of the explanation for the high numbers used by abolitionists and nuclear critics.

But the idea that hundreds of billions can be cut without effect from the nuclear budgets is a dangerous fallacy. Cuts to either current operations and maintenance or modernization take us down a gradual disarmament path. Avoiding disarmament requires one to support modernization which is simply replacing old legacy forces with newer technology. The new technology is also designed to make the cost of subsequent sustainment and maintenance less expensive such as being able to forgo the redoing of the reactor cores on the submarines or being able to sustain the ICBMs without having to open up the silo doors. The new technology also would enable ICBM warheads to penetrate to their targets, and bombers to better get through air defenses, and allow submarines to stay on patrol longer and be more survivable.

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There are critics that think the United States “modernization” is synonymous with what is termed “nuclear warfighting,” or the idea that nuclear weapons far from being viewed as stopping conventional and nuclear conflict have now become seen as instruments of actually conducting war. Such allegations are silly but they are also dangerous, as they make a number of Americans who swallow such baloney actually believe their leaders want to risk blowing up the world. The United States deterrent strategy holds at risk those key elements of an adversaries power they most value. That would include leadership, military forces, the security forces that keep them in power, and the defense production industry. That has been the US strategy for seven

It is important to remember that the force being built was completely consistent with the New START treaty numbers of 1550 “official” allowable numbers. Given the strategic force modernization the US was undertaking was not going to exceed the force allowed by the New START agreement, it is thus impossible to describe such a force build as somehow instigating or creating an “arms race” unless the New START treaty itself was an “arms race” and not “arms control.

decades and has been adopted by each of the past 13 administrations dating back to the Eisenhower administration.

The currently planned modernized nuclear forces was cemented into the United States strategy during the period just before and during negotiations over the New START agreement of 2010. This arms control treaty pretty much mirrored the warhead numbers of the Moscow Treaty of 2002, but the treaty was far more detailed with verification measures lacking in the Moscow agreement. However, the verification measures of START I remained in effect through 2009 and thus the Moscow numbers could be verified and acted as a bridge to the New START agreement. But the strategic nuclear force structure adopted was that of the New START treaty and vice versa.

Critics of the modernization effort claim the administration was jammed up by the military into agreeing to an excessive build-up when in fact the adopted arms control numbers in New START were what the US could build to, no more and no less. As General Cartwright told me at the time, he was going to split the difference between the SNDVs the US had and those in the Russian forces but Russia insisted the US reduce those even further so Moscow would not have to build-up too far to match the US force levels. The administration at the time met with Senator Jon Kyle to put the deal together. The Senate leaders pledged to support the New START agreement and the administration in return would support an across-the-board

modernization of the nuclear forces including the Triad of nuclear platforms, the nuclear command and control and the NNSA warhead complex.

It is important to remember that the force being built was completely consistent with the New START treaty numbers of 1550 “official” allowable numbers. Given the strategic force modernization the US was undertaking was not going to exceed the force allowed by the New START agreement, it is thus impossible to describe such a force build was somehow instigating or creating an “arms race” unless the New START treaty itself was an “arms race” and not “arms control.” As for the United States and the enthusiasts’ push for further US nuclear force reductions toward zero or abolition, the widespread conventional wisdom at the time of the New START agreement was that Russia and China would be cooperative with the United States both in preventing the proliferation of nuclear weapons and preventing the access to nuclear weapons by terrorist organizations, with little concern that either Russia or China were going to embark or already had embarked on building up their nuclear forces by many additional thousands of warheads.

In fact, four foreign policy and security leaders—George Schutz, Henry Kissinger, Sam Nunn and William Perry—had taken a message to the American public calling for the eventual abolition of nuclear weapons. They urged the US to start a march “up the abolition mountain” even if the summit was not yet visible through the clouds of current challenges to strategic stability that still remained among the nuclear powers of the globe. Eventually Dr. Henry Kissinger would write with General Brent Scowcroft that such a move was not such a good idea, the latter telling me that the “four horsemen” as they came to be known had “got a little ahead of things,”

The cost of the nuclear force was not that of a nuclear force designed for “warfighting” but for sustaining deterrence at warhead levels some 90% less than the 10,000 plus sustained at the end of the Cold War just prior to the collapse of the USSR. Senator Dan Coats told the Senate that as the US was going to ratify the START 1 arms control agreement with Moscow, the US was facing a country with some 13,100 long-range strategic nuclear warheads [the US had some 10,200] that were now going to be restrained to 6000 by the START 1 agreement, and eventually to 1700-2200 and 1550 by the Moscow and New START agreements, respectively, or an implied cut of upwards of 85-90%. In thus measuring the cost of the US nuclear modernization effort, one should not include the cost of sustainment and operations, as those costs will be incurred whether one modernizes or not. And given critics claim of wanting to sustain the legacy forces and not modernize, it hardly makes sense to include legacy force support in the “modernization” category. funding.

The combined RDT&E and Procurements costs for the ICBM and Submarine/ D-5 modernization package reaches \$300 billion over the next 30 years with most of the actual building between 2030-2042, assuming the current schedule remains. But over 30 years the cost per year comes to \$10 billion, which is some 3.2% of the \$310 billion the US DoD spends on all RDT&E and Procurement for all services. When the DoD estimates what weapons it buys every year, it does not include the nearly \$600 billion spent annually on operations, sustainment and personnel costs.

Modernization is a choice and it could involve upwards of replacing the platforms carrying 1550 warheads, (plus allowable bomber weapons for 60 strategic bombers including the B2 force and 40 B52s.) With the expiration of New START in 2026, the United States may face a growing Russian and Chinese nuclear force of both strategic and theater nuclear forces that some projections place at a combined 10,000 nuclear warheads by 2035-40, a decade and a-half hence, or equal in time to the distance from today back to the New START treaty ratification. Having a good metric for judging the cost of additional deployed warheads may be useful in making such decisions. The combined RDT&E and Procurements costs for the ICBM and Submarine/

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For strategic bombers, the US currently has 60 B2 and B52 bombers in the nuclear category. Of the 100 B21 bombers now scheduled for acquisition, some 20 are scheduled to be nuclear capable, which according to former US Defense official James Miller adds some 3% to the cost of a strategic bomber. Using 20% of the costs associated with the nuclear capable bombs

then raises the 30-year cost estimates for all nuclear platforms to \$325 billion, which comes to \$10.8 billion a year, or 3.5% of the current defense budget. A possible way of examining the modernization costs would be to determine what is the cost of maintaining an on-alert warhead for the submarines and the ICBMs, using the 30-50 years RDT&E and Acquisition costs or the modernization costs as opposed to total program costs including operations and maintenance that is also currently being undertaken for the legacy programs. What is new are the modernization costs for the replacement platforms.

The 1090 submarine warheads now in the force are on alert or able to hit their targets when deployed some 35-70% of the time depending upon your assumptions, given the actual alert rate is classified. Submarines can be in transit to and from their two bases in Georgia or Washington, or on patrol deep into the Pacific or Atlantic. For ICBMs, the alert rate reaches 98% of the 400

Minuteman missiles. For the Sentinel ICBM and Columbia submarine combined, the cost per year/alert warhead comes to \$9-11 million annually over 30 years. When looked at over the lifetime of the Triad platforms or through 2080, the costs come to an average of \$7 million per alert warhead/year, also hardly prohibitive, and well within any affordability metric for the United States.

Since the US sustains day-to-day deterrence by keeping our nuclear systems on alert, (to avoid a surprise decapitation), the cost of having roughly day-to-day 1000-1200 strategic warheads are the cost of modernization, which every day would in total cost the United States some \$11 billion annually. That is what we are planning to spend "extra" above and beyond what we are now spending for the current legacy forces, (although some limited RDT&E and Procurement Costs are associated with the legacy MM III ICBMs and Ohio-class submarines of around \$.5 billion a year each.)

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RDT&E and Procurement Costs are associated with the legacy MM III ICBMs and Ohio-class submarines of around \$.5 billion a year each.) One could reasonable add the costs of the NNSA programs at the Department of Energy to the costs of sustaining nuclear deterrence, as without redoing the warheads in the US force, the United States would be going out of the nuclear deterrent business, as Administrator Jill Hruby explained at a late July NIDS nuclear seminar at the Capitol Hill Club.

It is not that the NNSA is building new nuclear warheads because someone wants to go and fight a nuclear war. The NNSA is refurbishing and giving a life-extension to our warhead stockpile because without doing so, the US would be out of the nuclear deterrent business. Making the case that the United States is planning to spend too much on nuclear deterrence over the next decades is implicitly making the case the US should be out of the nuclear business. Not modernizing is simply

synonymous to slowly adopting unilateral nuclear disarmament because at some point, our legacy systems will not work anymore. This is precisely the point made some years ago by SASC member Senator Jean Shaheen (D-NH). We can “rust to obsolescence” and unilaterally disarm as PONI founder Clark Murdock warned or we can modernize. Those are the only two choices.

Source: <https://wariormaven.com/uncategorized/what-is-the-cost-of-a-modernized-nuclear-deterrent>, August 17, 2024.

OPINION – Robert Dougherty

Pulling Our Weight: Nuclear in Australia Should be a National Triumph, Not Political Fear Tactic

More anti-nuclear sentiment has bubbled to the surface in Australia as Parliament tabled the agreed legal framework for transferring nuclear materials and equipment under the AUKUS trilateral defence pact with the United Kingdom and the United States of America. Under the agreement, signed by all three partner countries in Washington last week, Australia will acquire nuclear-powered submarines among other critical defence technology for \$368 billion dollars. This new development is being closely followed by the most predictable and inane rusted-on no-nuclear criticism against Australia’s obligation to be responsible for the storage and disposal of its own spent nuclear fuel and radioactive waste used in the nuclear power units that are transferred under AUKUS. UK and US defence officials must now be wondering what an insane country they have allied with and militarily linked themselves to. It’s beyond belief that such a common sense and essential obligation is being disputed. If you want to have nuclear submarines, you must be prepared to

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store the nuclear material and waste they utilise or produce. Critics, such as the Australian Greens, have touted fear-mongering claims that Australia would become a dumping ground for radioactive waste produced by the US and the UK.

An unsurprising allegation considering their devoted opposition to nuclear energy, a campaign stifling decades of debate on the key international technology and industry. “Reports that the Albanese government have signed a secret AUKUS deal with the US are deeply concerning. The Albanese government wants to legalise dumping nuclear waste from the US and the UK here in Australia,” Greens senator for SA, spokesperson for environment Sarah Hanson-Young said “Labor need to come clean and guarantee that South

Australia will not become a nuclear waste dumping ground for the US and the UK “South Australia has long been the target for a dangerous nuclear waste dump and Labor need to clearly rule it out before the election “Between Labor’s nuclear subs and Peter Dutton’s nuclear power obsession, the Greens remain the only party in South Australia fighting to protect our nuclear-free state.” Australia will manage all radioactive waste generated by its own Virginia Class and SSN-

AUKUS submarines, including radioactive waste generated through operations, maintenance and decommissioning, according to the Australian Submarine Agency.

All waste, including spent fuel, will be managed safely, informed by international best practice and in accordance with Australia’s international and domestic legal obligations and commitments. Australia will continue to leverage decades of experience in safely and securely managing radioactive waste and will be supported by the UK and the US, whose experience and advice will

support Australia in building this capability – ASA said. “There is no prospect of any nuclear waste coming to Australia from the US or the UK. We will be handling our own nuclear waste, which is what we announced in March of last year,” Australian Deputy Prime Minister and Minister for Defence Richard Marles said, speaking to *ABC News Breakfast* earlier this week. ... Australia currently produces a relatively small amount of low-level radioactive waste and lesser volume of intermediate-level waste, according to information from the World Nuclear Organisation (WNO).

Each year, Australia produces about 45 cubic metres of radioactive waste, according to the WNO. In addition, the Australian Radioactive Waste Agency was set up to manage all radioactive waste in 2020 and there is ongoing consideration for national radioactive waste repository storage. “We’ve agreed to have nuclear-powered submarines, that’s what we’ve agreed to. And the transfer of technology that’s related to that, that we’ll have access to it as we announced,” Prime Minister Anthony Albanese said, speaking to a press conference in Perth on 9 August. “There’ll be no nuclear transfer (of waste) from either the US or the UK. That’s the detail. That’s very clear. And that’s not part of the arrangement. Nuclear submarines have nuclear reactors in them, that’s the detail there as well. “We work with our allies in the United States and the United Kingdom, and these arrangements are very clear. “We’re very pleased that AUKUS, both Pillar I and Pillar II, has

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Final Thoughts: The debate over Australia storing the nuclear material and waste produced by the nuclear submarines we receive is ridiculous and overblown. It’s part of the AUKUS deal, we have the space, it’s common-sense and it’s not a significant issue to be faced with. This is in reality a golden opportunity that Australia has been gifted to better understand not only nuclear propulsion in submarines, but research, and comprehend nuclear energy, nuclear waste (yes that too) and countless other modern applications. We already operate three uranium mines in this country and we are now at last on the path to a nuclear-powered navy. Nuclear research and technology should be a national triumph, not a fear tactic wielded for political gain at the cost of countrywide technological progress.

Source: <https://www.defenceconnect.com.au/geopolitics-and-policy/14557-pulling-our-weight-nuclear-in-australia-should-be-a-nation-triumph-not-political-fear-tactic>, August 14, 2024.

NUCLEAR STRATEGY

USA

Joe Biden Approved Secret Nuclear Strategy Focusing on ‘Chinese threat’

The United States has updated a highly classified nuclear strategy to address China’s growing arsenal and its potential collaboration with Russia and other countries, *The New York Times* reported

on Tuesday. The “Nuclear Employment Guidance,” typically revised every four years, is accessible only to a select group of administration officials because of its sensitive nature. Even members of Congress do not have full access to the guidelines, which detail the US response in the event of a nuclear attack.

US President Joe Biden approved the revised plan in March, according to *The Times*. For the first time, the revised guidance explicitly mentions deterrence strategies aimed at “China’s

rapidly expanding nuclear arsenal,” *The Times* said. The document also addresses the potential for coordinated attacks involving China, Russia, North Korea and Iran. Senior Biden administration officials have hinted at the change before. In June, Pranay Vaddi, a senior director at the National Security Council, told an arms control conference that, in light of “the realities of a new nuclear era,” Biden had expanded the policy to address the threats posed by these countries. “[The revised policy] emphasises the need to account for the growth and diversity of the PRC’s nuclear arsenal – and the need to deter Russia, the PRC and North Korea simultaneously,” Vaddi said.

Vaddi also revealed that Washington was considering expanding its arsenal to counter the offensive capabilities of its adversaries. This would mark a significant shift from the post-Cold War era, when the US began diplomatic efforts to reduce global nuclear stockpiles. “Russia, the PRC and North Korea are all expanding and diversifying their nuclear arsenals at a breakneck pace – showing little or no interest in arms control,” Vaddi said.

In a short statement after *The Times’* report, the

White House said the review of Nuclear Employment Guidance “is in no way secret ... [and] is not a response to any single entity, country nor threat”. China’s nuclear capabilities

have drawn increasing scrutiny from policymakers and researchers worldwide. In June, the SIPRI reported that China had increased its nuclear arsenal by 90 warheads, bringing its total to 500 as of January. The report also projected that China’s total number of intercontinental ballistic missiles – currently around

238 – could surpass the US’s 800 or Russia’s 1,244 within the next decade. The US and China resumed informal nuclear arms talks in March for the first time in five years. However, all negotiations were suspended in July in response to US arms sales to Taiwan. Chinese Foreign Ministry spokesperson Lin Jian said the sales had “seriously compromised the political atmosphere for continuing the arms control consultations”. The issue was also raised by

Republican presidential nominee Donald Trump during a conversation with Elon Musk on X, formerly Twitter. Trump expressed concern about China catching up to US nuclear capabilities. “That’s where you need a strong American president because you just, you don’t want to have this proliferation,” Trump said. This is not the first time that military

cooperation between Beijing and other US adversaries has led to changes in defence policy.

In May, US Air Force Lieutenant General Jeffrey Kruse, who is director of defence intelligence at the Pentagon, told the US Senate Armed Services Committee that “even if Russia and China in a

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military force are not interoperable, they would certainly be cooperative”, prompting the armed forces to review their strategies. At the same hearing, US Director of National Intelligence Avril Haines said Sino-Russian operations were “prompting new planning across the government in many respects”, citing the countries’ joint naval exercises as a cause for concern. Lyle Goldstein of the Washington-based think tank Defence Priorities said the shift in US nuclear strategy reflected a simple calculation based on the assumptions of a worst-case scenario: war against multiple nuclear-armed adversaries at the same time.

But Goldstein, who for decades was a professor at the US Naval War College, believed “there is little or no evidence to suggest a serious degree of coordination between Moscow and Beijing, let alone with Pyongyang, on the use of nuclear weapons”. “While it is impossible to rule out some informal cooperation – and there is the quite real possibility of sharing of technology and even doctrinal principles – the actual possibility of coordinated use of nuclear weapons among these three states against the US seems extremely unlikely and even far-fetched,” he said. The moves could be motivated in part by the war in Ukraine and growing cooperation between Russia and China, Goldstein added. The view to date, he said, was that Beijing, Moscow and Pyongyang “had acted with a decent amount of restraint in terms of formalising their military and strategic

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coordination”. “Washington would be well advised to avoid hysterics, apply realism and restraint to various foreign-policy dilemmas and search for areas of future cooperation among the great powers, including a re-engagement with arms control.”

Source: <https://www.scmp.com/news/china/diplomacy/article/3275251/biden-approved-secret-nuclear-strategy-focusing-chinese-threat-us-report-says>, August 21, 2024.

BALLISTIC MISSILE DEFENCE

INDIA

India’s New Naval Missile: Intercepting Mach 7 Anti-Ship Ballistic Missiles

India’s DRDO is developing a new long-range surface-to-air missile for the Indian Navy, boasting a range exceeding 250 km. This advanced missile will also be capable of intercepting Anti-Ship Ballistic Missiles (ASBMs) travelling at speeds up to Mach 7, providing a formidable shield for warships against a wide range of aerial threats. The missile is likely the naval version of a missile from the Long Range Surface-to-Air Missile (LRSAM) system being developed under Project Kusha. Project Kusha encompasses three long-range air defence missiles with ranges of 150 km, 250-300 km, and 400 km, drawing parallel to the Russian S-400 system. While DRDO is simultaneously working on a ballistic missile defence shield to protect India from long-range nuclear-tipped missiles, the LRSAM system will significantly enhance India’s defences against

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tactical and short-range ballistic missiles, particularly during their terminal phase. The development of this naval variant is especially crucial given the increasing threat posed by ASBMs.

Growing Threat of Anti-Ship Ballistic Missiles:

Ballistic missiles, known for their high speeds and heavy payload capacities, follow a predetermined trajectory to deliver warheads to their targets. Traditionally used for land-based targets, these missiles have been repurposed for anti-ship roles in recent years to effectively breach enemy air defences and damage warships using kinetic energy. These repurposed missiles are termed Anti-Ship Ballistic Missiles. China was the first to develop ASBMs, recognizing their potential to counter advanced naval capabilities. The country has deployed several types, including the short-range CM-401, medium-range DF-21D, and YJ-21. These missiles have varying ranges and payload capacities, tailored to target different types of naval vessels. The DF-21D, for example, has been dubbed the “carrier killer” due to its ability to strike aircraft carriers at long distances.

Iran has also claimed to possess similar missiles, which it touts as a means to counter the naval presence of the United States and its allies in the Persian Gulf. The Houthis, a rebel group in Yemen, have employed these weapons to target commercial vessels in the Red Sea during their campaign against Israel and its allies. This development has raised concerns about the proliferation of ASBM technology to non-state actors and its implications for global maritime security. The United States is also developing the

anti-ship version of its short-range Precision Strike Missile (PrSM). ASBMs’ speed, accuracy, and

destructive potential make them a significant threat to navies worldwide, necessitating robust countermeasures.

Indian Navy’s Efforts to Counter ASBM Threats:

In response to the growing ASBM threat, the Indian Navy is intensifying its efforts to bolster its defences against ballistic missile threats. Last year, the DRDO and Indian Navy

successfully tested the Naval Ballistic Missile Defense System, which is capable of intercepting nuclear missiles in space and within the Earth’s atmosphere, offering a robust sea-based defence. This successful test demonstrated India’s capability to protect its naval assets from long-range missile threats, enhancing the overall security of its maritime operations.

While the naval BMD system is specifically designed to counter nuclear-tipped missiles and ASBMs, the naval long-range surface-to-air missile will have dual capability similar to the American SM-6. The new missile, capable of intercepting aircraft at long distances and intercepting ballistic missiles in their terminal phases, will act as a lower-tier defence against ballistic missiles, providing

a comprehensive multi-layered defence system. The ongoing development of long-range air defence systems underscores India’s commitment to securing its maritime interests. These advanced missile systems will enable the Indian Navy to address high-speed threats from contemporary ASBMs, ensuring the protection of its fleet in hostile environments. Integrating these systems

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into the navy's defence architecture will enhance its ability to operate in contested waters, maintaining the strategic advantage.

Source: <https://bharatshakti.in/indias-new-naval-missile-intercepting-mach-7-anti-ship-ballistic-missiles-2/>, August 20, 2024.

PAKISTAN

Pakistan Conducts Successful Training Launch of Surface-to-Surface Ballistic Missile

The Pakistani military on Tuesday conducted the successful training launch of its surface-to-surface ballistic missile Shaheen-II, the army said. "The training launch was aimed at training of troops, validating various technical parameters and performance evaluation of different sub-systems incorporated for improved accuracy and enhanced survivability," the army said in a statement. The military provided no further technical information. The training launch was witnessed by senior officers from the Strategic Plans Division, Army Strategic Forces Command, scientists and engineers of strategic organisations. The Director General Strategic Plans Division appreciated the technical prowess, dedication and commitment of scientists who contributed towards this achievement. President Asif Ali Zardari, Prime Minister Shehbaz Sharif, Chairman Joint Chiefs of Staff Committee General Sahir Shamshad Mirza and services chiefs congratulated the scientists and engineers on the achievement. In May, Pakistan conducted a successful training launch of the Fateh-II Guided Rocket System having a range of

400 kilometres.

Source: <https://economictimes.indiatimes.com/news/defence/pakistan-conducts-successful-training-launch-of-surface-to-surface-ballistic-missile/articleshow/112655444.cms?from=mdr>, August 20, 2024.

The training launch was aimed at training of troops, validating various technical parameters and performance evaluation of different sub-systems incorporated for improved accuracy and enhanced survivability," the army said in a statement. The military provided no further technical information. The training launch was witnessed by senior officers from the Strategic Plans Division, Army Strategic Forces Command, scientists and engineers of strategic organisations.

PD 24 was held with multiple Allied navies from Jul. 20 to Aug. 13 in the waters around the Hawaiian islands. Developed by the NSW PHD (Naval Surface Warfare Center Port Hueneme Division), the existence of the IAM D-T was first reported by NAVSEA (Naval Sea Systems Command) in Sep. 2023. The system is described as a "semi-guided target designed to trigger and engage terminal ship defense combat systems, such as Standard Missile (SM)-2 and SM-6.

USA

Pacific Dragon 2024 Exercise Tests New IAM D Target Vehicle Against Standard Missiles

This year's edition of the U.S. Navy and MDA's biennial Pacific Dragon 2024 exercise, which involves the testing of the SM-2 and 6 (Standard Missile-2, 6) anti-air interceptors, featured the debut of the new IAM D-T (Integrated Air and Missile Defense – Target). PD 24 was held with multiple Allied navies from Jul. 20 to Aug. 13 in the waters around the Hawaiian islands. Developed by the NSW PHD (Naval Surface Warfare Center Port Hueneme Division), the existence of the IAM D-T was first reported by NAVSEA (Naval Sea Systems Command) in Sep. 2023. The system is described as a "semi-guided target designed to trigger and engage terminal ship defense combat systems, such as Standard Missile (SM)-2 and SM-6. BMD (Ballistic Missile Defense) exercises testing the SMs often employ the ARAV (Aegis Readiness and Assessment Vehicle), whose 'B' variant (ARAV-B) was also fired as a part of PD 24 from the Pacific Missile Range Facility, Hawaii. The exercise later saw the launch of a SM-6 for the first time from HMAS Sydney earlier, as The Aviationist had reported.

The Exercise: Hosted by the U.S. Navy’s 3rd Fleet, PD 24 is “designed to improve participating forces’ ability to work together to track and intercept ballistic missiles.” They conducted live-fire, simulated ballistic missile intercepts and tracking events to exercise, refine and improve their integrated air and missile defense (IAM D) capability in a coalition environment.

In addition to the United States, the participating nations include Australia, Italy, Japan, Republic of Korea and the Netherlands.

The platforms include the HM A S Sydney from the RAN (Royal Australian Navy) and E-7A Wedgetail of the RAAF (Royal Australian Air Force); Italian Navy’s ITSM ontecuccoli; JM SDF’s (Japan Maritime Self-Defense Force) JS Haguro, ROKS Yulgok Yi I; Dutch warship HNL M S Tromp; an MQ-9 from the 163rd Attack Wing of the California Air National Guard; and the U.S. Navy’s USS Carl M. Levin, USS Kidd, USS Shiloh, and P-8A Poseidon MPA aircraft. The service added that “PD 24 was the first to use a new and improved target called an Integrated Air and Missile Defense Target (IAM D-T).”

The IAM D-T has been described as “a semi-guided target designed to trigger and engage terminal ship defense combat systems, such as Standard Missile (SM)-2 and SM-6.” “Through exercises and engagements like Pacific Dragon, we improve system interoperability and tactical procedures with our allies and partners,” said 3rd Fleet commander Vice Adm. John Wade. “Combined operations and Integrated Air and Missile Defense tracking and live-fire events improve our proficiency. On Aug. 7, an ARAV-B was launched from the Hawaii facility, which was possibly engaged by a Standard Missile from one

of the warships. ARAV is a solid-fuel rocket target which emulates ballistic missiles, helping to prepare the fleet to defend against those threats. On Aug. 11, two days prior to the exercise’s

conclusion, the warships of the participating countries sailed in formation, as shown by a photo released by the USN.

IAM D-T: Last year, the NSWC’s White Sands Department said, it performed two developmental flight tests for the IAM D-T, one during Pacific Dragon 2022 and

the other during Exercise Formidable Shield in May 2023. On the same occasion, NAVSEA had already announced “a third IAM D-T test for the next Pacific Dragon in Aug. 2024.”

At the time it said that the target vehicle would carry a qualified flight termination system, allowing range control to disable the vehicle remotely. The goal of the test flight was

“demonstrating the vehicle’s full guidance capability during all phases of flight, rather than just the final descent.” The service has not released an image of the IAM D-T or details about the weapons used against it. On the other hand, as will be explained subsequently, the ARAV-B is likely to have

been engaged by an SM-3, given public reports of the US’s BMD testing regime, although the USN only explicitly mentioned SM-2 and SM-6.

ARAVs and Standard Missiles: The ARAV “emulates ballistic missiles, which helps prepare the fleet to defend against those threats,” according to NAVSEA. “ARAVs have tested the capabilities of multiple military combat systems, including the Navy’s Aegis Ballistic Missile Defense, the Army’s Terminal High Altitude Area Defense and the Patriot surface-to-air missile system. Three

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variants of ARAV are currently available, which differ in their range, on-board guidance and rocket motors to simulate short, medium and intermediate range ballistic missiles. It appears that Kratos Defense manufactures the ARAVs, given their extensive description of the testing aids on their websites.

Going by the company's release from Nov. 27, 2023 and a CRS report from Aug. 6, 2024, the ARAVs have primarily been used during testing of the SM-3, specifically the SM-3 Block 1A variant, since Jun. 2006. ARAV variants simulating short, medium and intermediate range ballistic missiles were used in these tests. The tests are called the Flight Test Aegis Weapon Systems (FTMs). The one in Nov. 2023 was FTM-48, also called Exercise Vigilant Wyvern, and resulted in a successful intercept of an SM-3 Block 1A against "two short-range targets." The test "demonstrated the capability of a ballistic missile defense-configured Aegis ship to detect, track, engage and execute intercepts of two SRBM targets while concurrently demonstrating an Anti-Air Warfare (AAW) engagement of two subsonic anti-ship cruise missile drone targets."

Source: <https://theaviationist.com/2024/08/19/pacific-dragon-2024-exercise-tests-new-iamd-target-vehicle-against-standard-missiles/>, August 19, 2024.

EMERGING TECHNOLOGIES AND DETERRENCE

USA

U.S. Keeps Artificial Intelligence Away from Nuclear Control; China, Russia Uncertain

U.S. strategic forces prohibit the use of artificial intelligence to authorize nuclear weapons operations even though nuclear-armed adversaries China and Russia may not, the commander of Strategic Command said Tuesday. Air Force Gen. Anthony Cotton, chief of the command based in Omaha, Nebraska, also

suggested that U.S. nuclear forces may be increased to maintain deterrence against the rising nuclear threat from the country's two "near-peer" adversaries.

In a briefing with reporters, Gen. Cotton said artificial intelligence and machine learning could give human decision-makers valuable tools for analyzing large amounts of intelligence, surveillance and reconnaissance data.

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In June, the White House revealed that the Chinese government said it would not match a Biden administration policy of restricting the use of artificial intelligence in decisions about the use of nuclear arms. Beijing's fast-growing nuclear arsenal has been a source of rising unease for U.S. military planners.

Biden administration policy of restricting the use of artificial intelligence in decisions about the use of nuclear arms. Beijing's fast-growing nuclear arsenal has been a source of rising unease for U.S. military planners. Tarun Chhabra, director of

technology at the White House National Security Council, said China has rejected the U.S. position that autonomous systems should not be near any decision to launch a nuclear weapon. Beijing rejected limits on AI use for its rapidly expanding nuclear forces in May during U.S.-Chinese talks in Geneva. "We think all countries around the world should sign up to that," Mr. Chhabra said during a think tank talk. "We think that makes a lot of sense to do."

Artificial intelligence will be used for large-scale processing of sensor data to track mobile missiles on land and submarines at sea, especially when combined with other technology such as quantum sensors, according to testimony to a congressional China commission. Critics argue that relying on artificial intelligence systems to make nuclear command and control decisions could destabilize the concept of deterrence by allowing the targeting of systems once considered safe from attack. The White House is said to be preparing a policy memorandum limiting the use of AI. China's rejection of limits on AI in nuclear weapons is raising concerns that Beijing may be considering an automated nuclear response system that could fire missiles if an enemy nuclear first strike

eliminates the communist regime's senior leaders and decision-makers. During the Cold War, Russia developed a similar system called Dead Hand, or Perimeter. It is thought to still be in use.

The Russian system is capable of automatically launching intercontinental ballistic missiles

through preexisting commands sent to missile silos if sensors detect a nuclear strike after commanders are killed or incapacitated. China's nuclear command and control system remains opaque, and U.S. officials say it is not clear how the People's Liberation Army Rocket Force would employ AI in a crisis. Chinese

officials say that even discussing such systems with the United States would undermine nuclear deterrence. Instead of engaging with U.S. officials on using AI in strategic weapons, Chinese officials have protested U.S. restrictions on microchips that could accelerate China's domestic AI industry and research, based on Washington's concerns that the technology will boost the power of the People's Liberation Army.

Sufficient but Aging: On the need for expanding U.S. nuclear forces, Gen. Cotton said current systems of land-based missiles, bombers and missile submarines are efficient, safe and credible but aging. All three elements of the nuclear triad need to be modernized, he said. The strategy is not expected to change, but the size of the force may be increased to "hold adversaries at risk." "So that's where we're looking at now, as far as ensuring that I continue to have the capacity and capability with the

systems that I currently have, the legacy systems, and ensure that the modernization and that transition from legacy systems to modernized systems, that those modernized systems can still meet the objectives of the president of the United States," Gen. Cotton said. He said Strategic

Command is analyzing the option of adding warheads to the existing force of land-based ICBMs. Each of the 400 Minuteman III missiles currently deployed has three warheads. A new Sentinel ICBM is in development.

On the first flights by four nuclear-capable Chinese and Russian bombers into the American air defense

zone near Alaska last month, Gen. Cotton said the flights were less a concern than where they originated. Public reporting said the two Russian Tu-95 and two Chinese H-6 bombers took off from

a Russian strategic nuclear base in the Far East called Anadyr. Gen. Cotton said the use of the base by Chinese bombers means "we now have to pay attention as far as access that the PRC might have because of the relationship they have with the Russian Federation." ...

For U.S. nuclear strategists, China's buildup of forces is proving particularly concerning. In February congressional testimony, Gen. Cotton called Beijing's

nuclear arsenal expansion "breathtaking." China's warhead stockpile has risen from about 250 warheads to around 500 over the past several years, and the Pentagon projects Beijing is on track to reach 1,500 warheads by 2035. China is estimated to have a total of 3,150 missiles of all ranges, most of which can be equipped with either nuclear or conventional warheads. Beijing has

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refused to explain the nuclear force buildup, either publicly or with U.S. officials. Chinese President Xi Jinping announced in 2022 that his goal is to build “a strong strategic deterrent system” that analysts say is a key element of a “trump card” in efforts to one day annex Taiwan.

Source: <https://highergroundtimes.com/higher-ground/2024/aug/13/us-will-not-let-automated-ai-system-decide-on-nucl/>, August 13, 2024.

NUCLEAR ENERGY

GENERAL

Nuclear Container Ship with Fourth-Generation Reactor Could Soon Become Reality

As demand for clean energy is increasing and countries are exploring alternatives for fossil fuels, a nuclear-powered container ship can help reduce cargo ship emissions. In this arena, three companies have launched a study to assess multiple factors including regulatory feasibility. Lloyd’s Register (LR), CORE POWER, and AP Moller – Maersk will research on frameworks needed to establish nuclear container ship using a fourth-generation reactor.

Nuclear Power in Container Shipping: The study will analyze requirements for updated safety rules along with the improved operational and regulatory understanding that is needed for the application of nuclear power in container shipping. “Since Maersk launched its energy transition strategy in 2018, we have continuously explored diverse low emission energy options for our assets,” said Ole Graa Jakobsen, head of fleet technology, A.P. Moller – Maersk. Jakobsen stated that nuclear power holds a number of challenges related to for example safety, waste management, and regulatory acceptance across regions, and so

far, the downsides have clearly outweighed the benefits of the technology. He stressed that if these challenges can be addressed by development of the new so-called fourth-generation reactor designs, nuclear power could potentially mature into another possible decarbonization pathway for the logistics industry 10 to 15 years in the future.

“Therefore, we continue to monitor and assess this technology, along with all other low emission solutions.” The study is expected to bring together the expertise of LR as a trusted adviser to the maritime industry, CORE POWER’s experience of developing advanced nuclear energy technology for maritime applications, a leading Port Authority and Maersk’s extensive experience in shipping

and logistics. “The initiation of this joint study marks the beginning of an exciting journey towards unlocking the potential of nuclear power in the maritime industry, paving the way for emissions-free operations, more agile service networks and greater efficiency through the supply chain,” said Nick Brown, CEO, Lloyd’s Register. Brown maintained that a multi-fuel pathway to decarbonizing the maritime industry is

crucial to ensuring we as an industry meet the IMO’s emission reduction targets, and nuclear propulsion shows signs of playing a key role in this energy transition. “There’s no net-zero without nuclear,” said Mikal Bøe, CEO, CORE POWER.

Bøe underlined that a critical key to unlocking the vast potential for nuclear energy to transform how the maritime sector is powered, is the standard framework for commercial insurability of floating nuclear power plants and nuclear-powered ships that would operate in nearshore environments, ports, and waterways. “We’re immensely pleased to be working with some of Europe’s most respected industry participants to set out the

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conditions for how this can be achieved,” added Bøe. The interest in nuclear-powered shipping is not limited to European companies. In China, state-run Jiangnan Shipyard has developed a design for a 24,000 TEU megamax containership incorporating MSR technology. The yard’s parent company, China State Shipbuilding Corporation (CSSC), has touted this ultra-large nuclear container ship as a solution for achieving true zero emissions throughout the vessel’s operating cycle, according to Logistics Insider.

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Source: <https://interestingengineering.com/transportation/nuclear-container-ship-cargo-operations>, August 17, 2024.

SM ALL MODULAR REACTORS

GENERAL

IAEA Updates Milestones Guidance for SM Rs

A new version of the IAEA publication Milestones in the Development of a National Infrastructure for Nuclear Power has been revised to address issues related to SM Rs. The updated document includes an annex outlining aspects specific to the deployment of SM Rs. It highlights recent experience of several countries that have completed or made major progress in all three phases with other reactor types as defined by the IAEA’s Milestones Approach. The IAEA Milestones Approach is a phased comprehensive method to assist countries that are considering or planning their

It highlights recent experience of several countries that have completed or made major progress in all three phases with other reactor types as defined by the IAEA’s Milestones Approach. The IAEA Milestones Approach is a phased comprehensive method to assist countries that are considering or planning their first nuclear power plant or seeking to expand an existing nuclear power programme. It splits the activities necessary to establish the infrastructure for a nuclear power programme into three progressive phases of development, with the duration of each dependent on the degree of commitment and resources applied in the country.

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The completion of each phase is marked by a specific “Milestone” at which progress can be assessed and a decision can be made about the readiness to move on to the next phase. This new

edition of the milestones publication, originally produced in 2007 and revised in 2015, incorporates lessons learned from recent Integrated Nuclear Infrastructure Review (INIR) missions to countries introducing or expanding nuclear power programmes. IAEA says that, while most new capacity is still expected to come in the form of large water cooled reactors in coming

years, there is a growing opportunity for SM Rs to play an important role in reducing emissions and supporting sustainable prosperity. SM Rs could be ideal for deployment in remote areas as well as regions with smaller electric grids. SM Rs will feature modular designs, enabling systems and components to be factory-assembled, which could help reduce the time required for construction.

With new end users, such as data centres, considering nuclear power to meet their growing electricity needs and a range of industrial

applications requiring decarbonisation, there are many potential applications. SMRs may be able to be deployed faster and play a larger role depending on how quickly they are licensed and achieve commercial readiness. Some SMRs, particularly those using coolants other than water, may generate new forms of radioactive waste, and so countries planning to deploy SMRs must plan to manage these new waste types. If new fuel types are employed, it will be important to establish a supply chain to secure the consistent availability of fuel. And new safeguards approaches may need to be developed to address certain novel design features of SMRs, ensuring that robust nuclear material accountancy and control measures are not hindered. There are currently around 30 newcomer countries either considering nuclear power or moving forward with plans to construct their first nuclear power plant. Bangladesh, Egypt and Türkiye are constructing their first nuclear power plants and several more countries are expected to build their first plants over the next decade.

Argentina, China and Russia have SMRs under construction, with the latter two countries having deployed their first SMRs in 2019 and 2021, respectively. Several newcomer countries, including Estonia, Jordan and Poland, have identified SMRs as part of their future clean energy systems. An INIR mission focused on SMRs was conducted in Estonia last October, and Jordan is examining how SMRs could be used to address its seawater desalination needs after meeting with IAEA experts last August. IAEA will host the first International Conference on Small Modular Reactors and their Applications from 21 to 25

October in Vienna. The conference will provide an international forum to take stock of progress and discuss opportunities, challenges and enabling conditions for the accelerated development and deployment of SMRs. ...

Source: <https://www.neimagazine.com/news/iaea-updates-milestones-guidance-for-smrs/?cf-view>, August 16, 2024.

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INDIA

India Modifies PHWRs for Private Sector

India's Indigenous 220 MWe PHWR design is being modified and converted to Bharat Small Reactors, preparatory to being transferred to the private sector, said Dr Ravi B Grover, a member of the Atomic Energy Commission in Ahmedabad and an Emeritus Professor at Homi Bhabha National Institute in Mumbai. He was speaking at IIM Ahmedabad (IIM-A) on the sidelines of an event to launch the report on net zero emissions transition for India. "India already has a live 220 MWe pressurised heavy water reactor design. We have a number of them working in the country including Narora (Uttar Pradesh), Rajasthan, Kakrapar (Gujarat), Kalpakkam (Tamil Nadu), Kaiga (Karnataka) and so on," he noted. "This particular design is being modified and converted as Bharat Small Reactors..."

sector, said Dr Ravi B Grover, a member of the Atomic Energy Commission in Ahmedabad and an Emeritus Professor at Homi Bhabha National Institute in Mumbai. He was speaking at IIM Ahmedabad (IIM-A) on the sidelines of an event to launch the report on net zero emissions

Bharat Small Reactors are nothing but 220 MWe pressurised heavy water reactors with some improvements." ... The NPCIL is in the process of making drawings for this. The modification is minimal, and change is incremental, he said. "It is not a new design (but) an existing and proven design. Other countries are trying to reinvent the whole thing. We already have it available, and the Department of Atomic Energy is ready to team (up) with the private sector and install them.

In other words, Bharat Small Reactors are nothing but 220 MWe pressurised heavy water reactors with some improvements." ... The NPCIL is in the process of making drawings for this. The modification is minimal, and change is incremental, he said. "It is not a new design (but) an existing and proven design. Other countries

are trying to reinvent the whole thing. We already have it available, and the Department of Atomic Energy is ready to team (up) with the private sector and install them.” He said NPCIL would design, install and operate these reactors for private companies that are looking for a captive power plant that can produce hydrogen for industrial use, or electricity. As to the safety features of the reactors, “The new 220 MWe will also have a steel liner and the control and instrumentation will be replaced. It is already a safe reactor, and it will become safer.” He said the modifications will not take more than a year to implement.

During the Budget speech for financial year 2024-25, Finance Minister Nirmala Sitharaman said the government would partner with the private sector to set up Bharat Small Reactors (BSR) as well as engage in research and development of Bharat Small Modular Reactor or BSMR. The PHWR technology in India was developed in co-operation with Canada. In the 1960s, the construction of the first 220 MWe reactor began as unit 1 at the Rajasthan Atomic Power Station. However, after India’s nuclear weapons tests in 1974, Canada withdrew its support and India developed and standardised the design itself.

Source: <https://www.neimagazine.com/news/india-modifies-phwrs-for-private-sector/?cf-view>, August 21, 2024.

NUCLEAR NON-PROLIFERATION

KAZAKHSTAN

Kazakhstan Hosts UNODA-backed Non-proliferation Regional Conference

Nearly twenty years ago, the United Nations Security Council took a consequential step to prevent the proliferation of WMD by unanimously adopting resolution 1540 (2004). This global instrument requires Governments to prevent non-

State actors or terrorists from acquiring, proliferating and using nuclear, chemical and biological weapons and their means of delivery.

The resolution calls on States to “develop appropriate ways to work with and inform industry [...]”, while UNSCR 2325(2016), a follow-up to resolution 1540(2004), explicitly acknowledges “the positive role performed by [...] industry [...] in the effective implementation of resolution 1540 (2004). In the two decades since its adoption, resolution 1540 has become a vital component of the global security architecture. Enacted under Chapter VII of the United Nations Charter, it recognizes that its full national, regional and

global implementation requires international cooperation and assistance. With a view to reinforcing the universal implementation of UNSCR 1540, over 30 participants representing governments, intergovernmental organisations, regulators and industry from seven States gathered in Kazakhstan’s capital Astana from 31 July to 1 August 2024.

The participants included Armenia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan and

Uzbekistan, as well as four international and regional organizations—Germany’s Federal Office for Economic Affairs and Export Controls (BAFA), UNODA, the United States Export Control and Border Security (EXBS) Programme, and the Organization for Security and Economic Cooperation in Europe (OSCE). In addition to States from the region sharing their reflections on the role of industry in preventing WMD proliferation within the context of UNSCR 1540, according to UNODA, “frank discussions were held between regulators and industry on trends and new developments in the region in the area of strategic trade controls, including on new challenges, such as intangible technology transfers and emerging technologies”.

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Industry also had an opportunity to share its perspective and expectations on effective licensing procedures, as well as on what it requires from governments to facilitate implementation of UNSCR 1540.

UNODA and German

Support: The United Nations Office for Disarmament Affairs (UNODA) and the Government of the Federal Republic of Germany supported the Government of Kazakhstan in this 'UNSCR 1540(2004) Regional Industry Outreach Conference for Central Asia and Neighbouring States (Wiesbaden Process)'. This was the second event in which UNODA worked with Germany to implement the Wiesbaden Process at the regional level in the Asia Pacific. The first—for Southeast Asian States—took place in Bangkok, Thailand, in September 2023. The rationale behind a “regionalised” approach is to help account for regional differences in strategic trade management and private sector regulatory practices.

UNODA provides substantive support in the area of the disarmament of weapons of mass destruction (nuclear, chemical and biological weapons). It supports and participates in multilateral efforts to strengthen the non-proliferation of WMD and in this connection cooperates with the relevant intergovernmental organizations and specialized agencies of the United Nations system. These are mainly the IAEA, the Organisation for the Prohibition of Chemical Weapons (OPCW) and the CTBTO PrepCom, in addition to supporting relevant multilateral treaties such as the Nuclear Non-Proliferation Treaty and the Biological Weapons Convention (BWC).

Source: <https://indepthnews.net/kazakhstan-hosts-unoda-backed-non-proliferation-regional-conference/>, August 19, 2024.

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The U.S. Department of Energy's National Nuclear Security Administration has awarded two groups of universities a combined \$50 million over five years for research related to the agency's nuclear security and nonproliferation missions. The universities will partner with the Department of Energy's national laboratories. UAF is in a group of 12 universities led by Georgia Tech.

USA

UAF Receives Funding to Enhance Nuclear Proliferation Detection

The University of Alaska Fairbanks has been named to a group of 12 universities tasked by the federal government with improving and expanding the nation's detection of nuclear weapons proliferation. The U.S. Department of Energy's National Nuclear Security Administration has awarded two groups of universities a

combined \$50 million over five years for research related to the agency's nuclear security and nonproliferation missions. The universities will partner with the Department of Energy's national laboratories. UAF is in a group of 12 universities led by Georgia Tech. A second group, of 15 universities, is led by the University of Tennessee, Knoxville. UAF's portion of the funding will come

to the Geophysical Institute and will fully fund two graduate student researchers for five years, one working with the Alaska Earthquake Center and the other with the Wilson Alaska Technical Center. The Wilson Alaska Technical Center operates nearly two dozen infrasound and seismic arrays worldwide that provide data used for monitoring nuclear proliferation, volcanic

eruptions and earthquakes. It supports the U.S. Department of Defense's nuclear proliferation monitoring and compliance with the Comprehensive Test Ban Treaty.

UAF's work will focus on improving detection of smaller activities that could be associated with the spread of nuclear weapons. “Traditionally in

seismology and infrasound we've focused on large explosions," said David Fee, the Wilson Alaska Technical Center's director. "If North Korea sets off a nuclear explosion, we record the seismic and infrasound signals."

... Advanced seismic monitoring can distinguish between an earthquake and a nuclear explosion based on the seismic waveforms and the nature of the ground shaking. Infrasound refers to sound waves with frequencies generally below the lower limit of human hearing. Nuclear explosions generate infrasound directly from the explosive event, resulting in a sharp, clear signal onset that is stronger and has a higher amplitude compared to most natural events. Signals from smaller events will be difficult to detect because they are weaker, meaning sensors using current technology would need to be closer to the source. Some of those may be in nations hostile to the United States, making it necessary to have a means of detecting those lesser events from a great distance. The goal for the funding coming to the Wilson Alaska Technical Center and the Alaska Earthquake Center is to improve technology for working at closer range and to detect smaller events, including low-yield nuclear detonations, from afar.

...Having two graduate students fully funded for five years and assigned to the task of detecting smaller nuclear proliferation events, including low-yield explosions, is a significant advance, Fee said. And it fits with the federal government's goal of training young scientists for work at the national laboratories and related agencies. ...There's also the benefit of working with other universities and with the Energy Department's national laboratories. ... The Wilson Alaska Technical Center and Alaska Earthquake Center perform nuclear proliferation monitoring work in part

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through the Defense Department-designated University Affiliated Research Center at the Geophysical Institute. UAF is one of 15 UARCs nationwide and the only one charged with the geophysical detection of nuclear proliferation. Funding is through the National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation.

Source: <https://www.gi.alaska.edu/news/uaf-receives-funding-enhance-nuclear-proliferation-detection>, August 19, 2024.

NUCLEAR SAFETY

UKRAINE

Safety at Ukraine Nuclear Plant Deteriorates After Nearby Blast: IAEA

The Russian management of the Zaporizhzhia nuclear power plant said a Ukraine drone dropped an explosive charge on a road used by staff, the TASS news agency reported earlier. Russia has been in control of the Zaporizhzhia site, the largest nuclear power plant in Europe, since soon after it launched a full-scale invasion of Ukraine in February 2022. The plant is dormant as Moscow and Kyiv have repeatedly accused each other of trying to sabotage its operations and endangering safety around the plant. "Yet again we see an escalation of the nuclear safety and security dangers facing the power plant," Grossi said.

The impact site was close to the essential cooling water sprinkler ponds and about 100 metres from the Dnirovaska power line, the only remaining 750 kilovolt line providing a power supply to the plant, the IAEA said. An IAEA team visited the area on Saturday and reported that the damage seemed to have been caused by a drone equipped with an explosive payload.

"I remain extremely concerned and reiterate my call for maximum restraint from all sides and for strict observance of the five concrete principles established for the protection of the plant." The impact site was close to the essential cooling water sprinkler ponds and about 100 metres from the Dnirovaska power line, the only remaining 750

kilovolt line providing a power supply to the plant, the IAEA said. An IAEA team visited the area on Saturday and reported that the damage seemed to have been caused by a drone equipped with an explosive payload. The report said there were no casualties and no impact on any nuclear power plant equipment. However, there was impact to the road between the two main gates of the plant.

The attack comes as Ukraine continues an incursion into Russia, claiming to have taken control of 82 settlements over an area of 1,150 square kilometres in the Kursk region since 6 August. Moscow wants to discuss the attack on the Zaporizhzhia plant with the IAEA, Russia's RIA news agency reported, citing Roman Ustinov, the acting Russian representative in Vienna.

Source: <https://www.euractiv.com/section/global-europe/news/safety-at-ukraine-nuclear-plant-deteriorates-after-nearby-blast-iaea/>, August 18, 2024.

NUCLEAR SECURITY

UK

Britain Launches £3.3 Million 'Nuclear Deterrence Fund'

According to a Prior Information Notice published on 15 August 2024, the Ministry of Defence (MoD) has unveiled a £3.3 million Nuclear Deterrence Fund to 'enhance research and expertise in nuclear deterrence'. This is designed to address the "growing and diversifying set of threats" facing the UK, including those posed by major nuclear-armed states, emerging nuclear powers, and state-sponsored nuclear terrorism. The fund, set to run from October 2024 to March 2027, aims to promote "innovative, high quality and impactful research in nuclear deterrence aligned with [His Majesty's Government] priorities" and to enhance the generation and application of evidence in

addressing UK nuclear deterrence policy challenges. Additionally, the MoD intends to support a "more equal, diverse and inclusive nuclear deterrence research workforce" through this programme.

Researchers and institutions are invited to submit proposals under two pathways: the Knowledge

Accelerator Pathway, which caters to short-term projects and early- to mid-career researchers, and the Advanced Pathway, which supports longer-term, multi-year research initiatives. The fund is expected to cover a broad range of funding requirements, typically ranging from £1,000 to £125,000 per project, with consortium bids assessed individually. The fund seeks to support

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the following objectives:

1. Promote innovative, high quality and impactful research in nuclear deterrence aligned with HM G priorities.
2. Improve and sustain the generation and use of evidence to address UK nuclear deterrence policy challenges and effectively embed research within deterrence policymaking.
3. Support institutions to attract, develop, and retain early- and mid-career researchers within the UK.
4. Support the formation of a more equal, diverse and inclusive nuclear deterrence research workforce.
5. Establish enduring and sustainable structures of engagement and knowledge exchange between nuclear deterrence researchers and policymakers.

To take part, interested parties must register on the Defence Sourcing Portal (DSP), where they will undergo due diligence before becoming eligible to submit their proposals. The MoD make clear

int he notice that this fund is part of a broader commitment to strengthening the UK's deterrence capabilities and ensuring the nation is prepared for future security challenges. The MoD also outlined its objective to "establish enduring and sustainable structures of engagement and knowledge exchange between nuclear deterrence researchers and policymakers," ensuring that research outcomes are effectively integrated into policy-making.

Source: <https://ukdefencejournal.org.uk/britain-launches-3-3-million-nuclear-deterrence-fund/>, August 18, 2024.

URANIUM PRODUCTION

USA

U.S. Uranium Miners Already Producing More Than Last Year

As the energy transition continues from fossil fuels to cleaner sources like nuclear power, the U.S. Energy Information Administration (EIA) is already seeing increased production domestically in the United States, surpassing last year's numbers. "Uranium miners in the United States produced more than 82,000 pounds of uranium concentrate in the first quarter of 2024, more than in all of 2023," confirmed the EIA. The organization noted that there are various factors contributing to the increased uranium production. The frequency and intensity of mining activity also increased, which is also requiring the need for more employees. This is a boon for the labor

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market. "The number of exploration and development holes dug—a precursor to uranium production—jumped from 260 holes in 2021 to 1,008 holes in 2022 and to 1,930 holes in 2023," they said. "The distance drilled per well, another precursor, increased from 123,000 feet in 2021 to 534,000 feet in 2022 and then to just over one million feet drilled

in 2023.

The number of full-time employees engaged in uranium exploration activities also rose from 42 employees in 2021 to 110 employees in 2023." From a global perspective, there's additional upside for uranium. Continued adoption is key for uranium prices. More countries are becoming receptive to uranium as an alternative energy source to meet emissions goals. Not all countries will be open to uranium given the history of past incidents. However, the EIA is still expecting an increase in uranium projects. "Uranium prices have

generally risen over the last five years as a result of several factors," the EIA said. "Worldwide supply and demand have balanced following a supply surplus after the Fukushima accident in 2011. Russia's invasion of Ukraine has caused some countries to rethink a move away from nuclear energy, and we expect uranium consumption to increase

from the nearly 60 reactors that are currently under construction around the world."

Add Double Exposure to Uranium: Traders looking to double up on their exposure to short-term spikes in uranium prices can look to funds like the Direxion Daily Uranium Industry Bull 2X Shares (URAA). Because of that added exposure,

experienced traders should only use these products. Per its baseline fund description, URAA provides 200% exposure to the performance of the Solactive United States Uranium and Nuclear Energy ETF Select Index. In particular, this index tracks the performance of U.S.-listed ETFs with a focus on uranium and nuclear energy. It incorporates the top holdings such as Cameco Corporation and the Sprott Physical Uranium Trust.

Source: <https://www.etftrends.com/leveraged-inverse-channel/u-s-uranium-miners-already-producing-more-last-year/>, August 19, 2024.

Another Hedge Fund-Backed Producer Wants to Cash in on Wyoming’s Uranium Boom

Canada-based American Premium Uranium Inc. has begun exploratory drilling on mining claims in a 40-mile square area in central Wyoming’s Red Desert. Since becoming publicly traded in December, American Premium has begun exploratory drilling work in the Red Desert and New Mexico. It also has made a strategic purchase of American Future Fuel, a move that helps to consolidate the company’s mining claims in uranium districts in three states in the U.S. West. American Premium is backed by major investors like New Jersey-based hedge fund Sachem Cove Partners, which owns a third of the Vancouver-based company and has played a key role in carving it out from a larger player in Canada.

The refocused exploration firm has joined other players in the niche that are rushing along with other mining operations wanting to remove the critical ore from the arid land whose flagship city is Jeffrey City, a former uranium mining boomtown that went bust decades ago when the nuclear

The Red Desert’s major uranium-producing mining operation is Ur-Energy Inc., which recently raised \$60 million in a public offering of stock to help pay for possible acquisitions of mining claims in the fragmented uranium industry and to ramp up development of mining projects. Sachem Cove also owns about 25 million shares of Ur-Energy, according to Alkin.

industry fizzed out in the late 1970s after the infamous Three Mile Island accident in Pennsylvania. The industry is finding renewed life after the U.S. has taken steps to begin enriching its own nuclear fuel rather than buy from Russia. The U.S. wants to become less dependent on Russia

following its invasion of Ukraine two years ago and growing jitters that Russia might cut off its nuclear fuel supply.

Uranium Mania: Sachem Cove Partners has been staking uranium land in Wyoming when the price of the critical ore on the spot market was around \$20 a pound back in 2017, which has more than quadrupled in price since then — thanks to Russia’s dominance of enriched fuel. “People were telling us we were nuts,” said Michael Alkin, chief investment officer of Sachem Cove Partners, a hedge fund based in Garden City, New Jersey. “We

We have some historic technical work that suggests there’s somewhere between 8- and 12.5 million pounds of U308 (uranium ore) there,” he said. Overall, the company controls a significant land position of about 25,500 acres of mineral rights within the western part of the Great Divide Basin.

are glad we didn’t didn’t listen to them.” The Red Desert’s major uranium-producing mining operation is Ur-Energy Inc., which recently raised \$60 million in a public offering of stock to help pay for possible acquisitions of mining claims in the fragmented

uranium industry and to ramp up development of mining projects. Sachem Cove also owns about 25 million shares of Ur-Energy, according to Alkin. Ur-Energy anticipates using some of the proceeds from the public offering of 57.2 million shares to supplement working capital for the continued ramp-up at its Lost Creek mining and production site in Wyoming’s Red Desert and development at its Shirley Basin mine in central Wyoming.

A Cyclone: Last month, American Premium Uranium began exploratory work on its Cyclone project, which is about 12 miles to the west of Ur-Energy’s Lost Creek operation, said American

Premium CEO Colin Healey. “We have two targets on this property that we’re going to spend about \$2.3 million on between 2024 and 2025, drilling about 70 holes and do about 50,000 feet of drilling,” Healey told Cowboy State Daily. “We have some historic technical work that suggests there’s somewhere between 8- and 12.5 million pounds of U308 (uranium ore) there,” he said. Overall, the company controls a significant land position of about 25,500 acres of mineral rights within the western part of the Great Divide Basin. “Our work is all exploratory right now,” Healey said. Besides the Cyclone project, American Premium has prominent uranium-producing regions in the Grants mineral belt in northwestern New Mexico and the Uruvan mineral belt in central Colorado.

Spin-Off Takes Off: American Premium picked up its Wyoming and Colorado uranium assets when it was created through the spin-off of those U.S. businesses from Consolidated Uranium Inc. in November 2023. Schem Cove, which owned uranium mining claims already in Wyoming and elsewhere along with other investors, combined its holdings with those that were brought under the umbrella of Premium American, which began trading publicly in December. That spin off happened prior to Consolidated Uranium selling off near-term production assets to IsoEnergy Ltd. for \$667.9 million, in December 2023. A Utah uranium mine went to IsoEnergy as part of the deal.

Essentially, the U.S. assets were spun off to Premium American with most of the international assets – except the Utah mine — going to IsoEnergy. Healey said that it’ll take two more years of exploration drilling to “define and delineate” the uranium resources at Great Divide Basin. “If you find 8 million pounds, it might not be economic to build your own processing plant,” Healey said. However, given that Ur-Energy has

its Lost Creek processing plant only 12 miles away from American Premium’s find, it might make sense to take the ore to Ur-Energy for processing instead of building a new plant – unless the drilling shows that there’s upwards of 12 million pounds in the ground, he said. “That’s the capability that they already have that we would be interested in, which could include contracting with them to process our ore or sell it to them or purchase the whole deposit from us,” he said.

Source: <https://cowboystatedaily.com/2024/08/19/another-hedge-fund-backed-producer-wants-to-cash-in-on-wyomings-uranium-boom/>, August 20, 2024.

NUCLEAR WASTE MANAGEMENT

USA

Nuclear Waste from Manhattan Project Headed to Southeast Michigan Landfill

The facility is owned by Republic Services, a private waste management company. Moving the waste is part of a larger remediation project for the Niagara Falls Storage site, which the corps manages. Transferring waste from contaminated sites to a few waste disposal facilities isn’t unusual, said Paul Wilson, a professor of nuclear engineering at the University of Wisconsin-Madison.

A southeast Michigan waste disposal site will soon be home to nuclear waste from the Manhattan Project, the World War II effort to develop an atomic bomb. The U.S. Army Corps of Engineers will transport contaminated soil, concrete, and groundwater

to the Wayne Disposal facility in Belleville, about 30 minutes outside of Detroit. The facility is owned by Republic Services, a private waste management company. Moving the waste is part of a larger remediation project for the Niagara Falls Storage site, which the corps manages. Transferring waste from contaminated sites to a few waste disposal facilities isn’t unusual, said Paul Wilson, a professor of nuclear engineering at the University of Wisconsin-Madison. “There’s dozens of small sites like this around the country that were involved in the Manhattan Project at some time,” he said, and consolidating the waste from those sites is “a prudent policy.”

Wilson emphasized that he cannot speculate about this particular facility or cleanup project.

He provided background information about how the United States typically disposes of nuclear waste. "In modern times, we have good regulation in place and good standards in place to safely store and manage this material." How the corps transports that material depends on how radioactive it is, its source and several other variables, he said. The material headed to Belleville is leftover residue from uranium extraction, according to the corps' website. The radioactivity levels of the waste are very low, according to a statement from the Michigan Department of Environment, Great Lakes and Energy.

The material will be transported and stored as safely as possible, said Kevin McNamara, the supervisor for Van Buren Township, where the facility is located. ...The corps held multiple public meetings earlier this year for residents near the Niagara site. Representative Debbie Dingell (D-Ann Arbor) and Wayne County Executive Wayne Evans are planning a town hall meeting, McNamara said. When asked for comment, Republic Services Senior Manager of External Communications Melissa Quillard said the site was fully qualified to store the materials. "Wayne Disposal is a Subtitle C landfill that is highly engineered with multiple safety measures in place and frequent inspections and systems tests to ensure everything is operating as it should," she said. "The material that will be accepted from the Niagara Falls Storage Site falls within the permit guidelines and will be managed safely, responsibly and in compliance with all local, state and federal

regulations."

McNamara said the corps, facility and township were taking extra precautions. ...State Representative Reggie Miller (D-Van Buren Twp) called for more transparency and communication in transportation of hazardous materials, according to a statement. ...State Sen. Darrin Camilleri, D-Brownstown Township, also weighed in. He called news

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of the waste shipment "alarming," saying in a statement that there needs to be a larger conversation about hazardous waste management in the U.S. "Wayne County is the most populous county in Michigan, and our state is surrounded by 20% of the world's fresh water. We cannot

Crews with U.S. Department of Energy Office of Environmental Management (EM) contractor Central Plateau Cleanup Company (CPCCo) placed about 6,500 cubic yards of the grout in the K West Reactor Basin. That's enough to fill two Olympic-size swimming pools. Crews started placing grout after pumping out contaminated water from the 1.2-million-gallon basin in July. The grout surrounds contaminated debris left in the basin and stabilizes it for future demolition.

continue to be America's dumping ground for toxic waste. Our district and our community deserve so much better," Camilleri said. Wilson, the nuclear engineering professor, said while the practice of moving hazardous waste for permanent storage is normal, it does raise questions about environmental justice. ...

Source: <https://www.bridgemi.com/>

michigan-environment-watch/nuclear-waste-manhattan-project-headed-southeast-michigan-landfill, August 20, 2024.

Hanford Stabilizes Last Reactor Fuel Storage Basin

Workers at the Hanford Site recently finished filling the last large concrete basin at the K Reactor Area with cement-like grout. The basin stored reactor fuel rods from the plutonium production mission. Crews with U.S. Department

of Energy Office of Environmental Management (EM) contractor Central Plateau Cleanup Company (CPCCo) placed about 6,500 cubic yards of the grout in the K West Reactor Basin. That's enough to fill two Olympic-size swimming pools. Crews started placing grout after pumping out contaminated water from the 1.2-million-gallon basin in July. The grout surrounds contaminated debris left in the basin and stabilizes it for future demolition.

The basin measures 125 feet by 67 feet. It contained 16 feet of water to provide radiation

shielding for workers. Crews filled the basin in three layers. The first foot covered contaminated debris on the floor. The second layer is 14 feet of controlled density fill, which is less dense than concrete. Workers placed a 9-inch layer of grout on top to complete the work. Drivers delivered about 750 truckloads of grout during the project. To shorten the time it took to go back and forth between deliveries, CPCCo built a grout plant nearby to reduce costs and improve efficiency. ...

Source: <https://www.energy.gov/em/articles/hanford-stabilizes-last-reactor-fuel-storage-basin>, August 20, 2024.



Centre for Air Power Studies

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