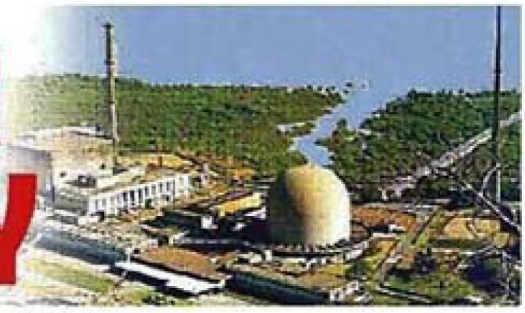
NUCLEAR SECURITY



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

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CONTENTS

OPINION – Andrew Futter

Is the United States Ready for the Third Nuclear Age?

The most pronounced component of this emerging nuclear context is the impact on U.S. deterrence and stability thinking driven by rapid and in some cases novel technological change. In the next few weeks, the Biden administration is likely to release both a Nuclear Posture Review (NPR) and a Missile Defense Review (MDR). These two documents are the chance for President Joe Biden and his national security team to "put their stamp" publicly on how they intend to approach issues of nuclear deterrence and national security policy. All previous NPRs and MDRs have marked an important moment in the evolution of U.S. nuclear thinking (each president has released an NPR since 1994 and an MDR since 2010), but the nuclear environment confronting the United States and the wider global nuclear order today will be quite different than what we have seen before.

This is because we are in a world far removed from 1994 when the Clinton administration sought to reorient U.S. nuclear policy toward the challenges of a post-Cold War "Second Nuclear Age," a reorientation that was broadly followed by Presidents George W. Bush, Barack Obama, and, to a lesser extent, Donald Trump in the years that followed. But today we stand on the cusp of a different nuclear world where the challenges to the United States and the global nuclear order are changing and diversifying. We can think of this as the start of a "Third Nuclear Age."

Second Nuclear Age," a reorientation that was broadly followed by Presidents George W. Bush, Barack Obama, and, to a lesser extent, Donald Trump in the years that followed. But today we stand on the cusp of a different nuclear world where the challenges to the United States and the global nuclear order are changing and diversifying. We can think of this as the start of a "Third Nuclear Age.

The move into a Third Nuclear Age does not necessarily mean that everything that the United States has done in the last three-quarters of a century to deter nuclear use against the homeland, allies, or forces based overseas is wrong or defunct, but rather that the locus of the nuclear threat has altered. Much as the attention of U.S. policymakers

shifted from nuclear war and arms racing with the Soviet Union to the dangers posed by regional and non-state actors in the 1990s and 2000s, today we are witnessing another transition to a world of disruptive technological change, nuclear great power competition, and challenges to the very foundation of the U.S.-led nuclear order.

The response will require a concerted shift away from three decades spent "tailoring" U.S. deterrence efforts to the perceived threats posed by "rogue states" such as North Korea by pursuing limited missile defenses, precision counterforce options, and "counter-proliferation," towards a renewed focus on strategic deterrence both above and below the nuclear threshold against major nuclear-armed adversaries and great powers. Balancing these deterrence pressures will not be easy.

Perhaps the most pronounced component of this emerging nuclear context is the impact on US deterrence and stability thinking driven by rapid and in some cases novel technological change. Of course, the impact and risk of technological innovation by adversaries has always played a role in US nuclear thinking, and for most of the nuclear era the US has been at the forefront of military technological innovation, but today this is different.

Perhaps the most pronounced component of this emerging nuclear context is the impact on US deterrence and stability thinking driven by rapid and in some cases novel technological change. Of course, the impact and risk of technological innovation by adversaries has always played a role in US nuclear thinking, and for most of the nuclear era the US has been at the forefront of military technological innovation, but today this is different.

This is because it is not just the "exotic" nuclear delivery systems such as hypersonic, orbital, or nuclear-powered missiles being developed by Russia, China, and others that matter, but rather the more subtle emergence of a suite of non-nuclear and in some cases non-kinetic capabilities that can be used by U.S. adversaries for strategic missions (such as very accurate ballistic, cruise, and hypersonic missiles for conventional counterforce attacks, increasingly capable defenses, kinetic and non-kinetic anti-satellite/counterspace operations, advances in anti-submarine warfare, and left of launch attacks on missiles and nuclear command and control using computer network operations). All of which are increasingly taking advantage of improvements in remote sensing, artificial intelligence, and autonomous platforms.

These strategic non-nuclear weapons (SNNW) are being developed by U.S. competitors—in many cases as a direct challenge to regional conventional deterrence architectures ultimately underpinned by U.S. nuclear guarantees. The development of SNNW is creating two interlinked sets of nuclear risks: first, that a U.S. adversary will view strategic non-nuclear weapons as more usable than nuclear weapons and threaten their use for coercion or to take greater risks in order to achieve some type of perceived advantage in a crisis; and second, that these systems become entangled in unforeseen ways which leads to rapid unintended escalation from the conventional to the nuclear level. A good example of this might be a "cyber" attack on a U.S. satellite or a command-and-control facility designed to degrade a particular tactical capability that is interpreted—incorrectly—as a precursor to a pre-emptive disarming strike because the "target" is used for both missions. Concurrently, a greater reliance on U.S. non-nuclear weaponry

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for strategic missions—including deterrence—may lower the threshold for nuclear use by U.S. adversaries, and at best, undermine nuclear arms control and stability.

Technological change is happening at the same time as—and is in many ways reflective of—a transition from an era of U.S. global predominance and unipolarity to a system of great power multipolarity and nuclear competition. One likely offshoot is the return of nuclear weapons, strategic posturing, and nuclear rhetoric to statecraft in a way reminiscent of the Cold War, with a concurrent likelihood of proliferation and possibly arms racing in both nuclear and strategic non-nuclear weaponry. Indeed, we have already seen the announcement of a suite of Russian strategic weapons systems ostensibly designed to overcome any future U.S. missile defense capability and a growing concern about the possibility of a rapid expansion of the Chinese long-range nuclear missile force for the same reason.

The final piece of the nuclear puzzle is that the Third Nuclear Age is likely to be characterized by a fissure in the nuclear order between those broadly wedded to the existing "orthodox" mechanisms of arms control and nuclear disarmament, and those demanding a different and more radical approach.

Such moves, of course, reflect the perceived deterrence requirements by adversaries to achieve "stability," but also the expanding political aspirations of Russia and China—and, to a lesser extent, India—to (re)shape their immediate security contexts. Consequently, these moves also have implications for both strategic deterrence and perceived regional imbalances in conventional forces and by implication for U.S. extended deterrence frameworks. We can see this playing out most acutely through recent events in Ukraine, but also reflected by increased competition in Northeast Asia and by a rising India seeking to balance the competing interests of other major powers in the subcontinent. To some extent, this return of great power competition was recognized by the Trump administration, but it will be more complex than just nuclear threats and involve competition across a number of levels including strategic non-nuclear weapons.

The final piece of the nuclear puzzle is that the Third Nuclear Age is likely to be characterized by a fissure in the nuclear order between those broadly wedded to the existing "orthodox" mechanisms of arms control and nuclear disarmament, and those demanding a different and more radical approach. We can most conspicuously see this in the agreement of the Nuclear Ban Treaty in 2017, calling for the abolition of nuclear weapons. For a generation, global society has acquiesced to an "incremental approach" to nuclear disarmament centered on the Non-Proliferation Treaty and parallel advances in nuclear arms control and non-proliferation. But patience is wearing thin. While the Ban Treaty almost certainly won't force the United States or the eight other nuclear-armed states to disarm any time soon, it is nevertheless symbolic of the view held by many outside the elite nuclear club that a nuclear order based on the efficacy of nuclear weapons for deterrence, and one that has effectively been fashioned and led by the United States, may be unsustainable in the longer term. This, in turn, raises awkward political questions about the role of nuclear weapons in U.S. defense and deterrence posture, and might potentially further increase the interest in using advanced conventional capabilities for various deterrence missions instead.

The most likely outcome of the NPR and MDR documents is a certain amount of business as usual: a commitment to maintain a safe and secure nuclear force, continued development of homeland and theater missile defenses, and perhaps a pledge to work towards stability and arms control with major strategic competitors. There will also almost certainly be reference to "great power competition," "new deterrence challenges," and perhaps "novel technologies." But the question is whether this will go far enough to meet the demands of a rapidly changing, and some would say deteriorating global nuclear order.

Ultimately, the Third Nuclear Age will be about more than nuclear threats and nuclear deterrence, it will also involve engaging with a growing range of strategic non-nuclear capabilities and missions both in terms of threats posed to the United States and as capabilities for the United States to deploy; challenges to regional nuclear stability in the Euro-Atlantic, Asia-Pacific, and South Asia; and a broader push back against the U.S.-led system of global nuclear governance and non-proliferation. In the longer term, it is not inconceivable that the Third Nuclear Age may also represent a gradual shift away from the United States as the major player in global nuclear politics; a position it has occupied since 1945.

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Source: https://nationalinterest.org/blog/techland-when-great-power-competition-meets-digital-world/united-states-ready-third-nuclear-age, 26 February 2022.

OPINION – Jack Kelly

Despite the Threat it Faces, Ukraine was Right to Give Up its Nuclear Weapons

Since Russia annexed Crimea in 2014, and even more so with its current military threat to the country, there has been much handwringing over Ukraine's decision to give up its nuclear weapons in 1994. Many have been asking whether Ukraine would find itself in its current predicament if it had not done so. Nuclear weapons are often viewed as the trump card in international relations; a threat an enemy knows always looms over them. But without the proper infrastructure, they are as dangerous to their owner as they are to the enemy, and they create a target for those who wish to acquire these weapons. Given the regional instability surrounding the newly independent post-Soviet states in 1991 as well as Ukraine's budgetary restrictions, lack of a structured military, and need to build global relationships, giving up its nuclear weapons in 1994 was the best decision to ensure that the country grew safely and created strategic partnerships.

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The Soviet Nuclear Weapons Inheritance: On December 25, 1991, Mikhail Gorbachev delivered the ten-minute speech that would be his final address as president of the Soviet Union—and the last moments of the state itself. He announced the dissolution of the Soviet Union and moments later the red flag with the hammer and sickle was lowered over the Kremlin as the tricolor flag of the Russian Federation replaced it.

The peaceful transition from one state to another seemingly took place over a matter of minutes that December evening but in fact many events had led to this moment. In the last of these—following Estonia, Latvia, and Lithuania securing their independence in September—the leaders of Belarus, Russia, and Ukraine met at a hunting cabin in the Belarusian forest on December 8 and agreed to dissolve the Soviet Union.

The 12 remaining Soviet republics overnight became independent countries. Due to this abrupt change, many plans and infrastructures of the Soviet Union were still in place as it had not planned to suddenly disappear. Most worryingly, its nuclear stockpile now belonged not only to Russia but also to Belarus, Kazakhstan, and Ukraine where they were spread. Belarus was left with over 100 nuclear weapons, Kazakhstan over 1,400, and Ukraine nearly 9,000 as well as 176 intercontinental ballistic missiles and 44 strategic bombers.

The international community focused immediately

on ensuring that the three countries joined the START I treaty to reduce nuclear weapons as well as the NPT. The first two agreed to transfer their nuclear arsenals to Russia, seeing an opportunity to be welcome into the international community as well as to offload the expensive maintenance costs of nuclear weapons.

Ukraine found itself in command of thousands of nuclear weapons—but without operational control over them. In Ukraine, some called immediately for sending the weapons to Russia; others called for keeping them as insurance against future aggression from other countries. Either way, the country found itself in command of thousands of nuclear weapons—but without operational control over them. The ability to detonate and use the weapons was still with Russia. By the fall of the Soviet Union, technological advancements in the form of Permissive Action Links had safeguarded most nuclear weapons and centralized who could activate them—only Moscow could trigger the use of the weapons.

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While in the current crisis this document has been discussed as one that should have provided a framework to protect Ukraine from Russian threats, the truth is muddier. The Budapest Memorandum calls for "respect[ing] the independence and sovereignty and the existing borders of Ukraine" and "refrain[ing] from the threat or use of force" against its borders. However, the United States was not prepared to offer a guarantee of security to Ukraine that "implied a commitment of American military force" in case of attack, as all NATO members enjoy with membership. This was strictly off the table for Ukraine."

Instead, assurances were given to Ukraine, with no mechanism for its protection or ensuring respect for its borders. The difference between an assurance and a guarantee to Ukraine was made clear by Russia's annexation of Crimea in 2014.

Ukraine's Correct Choice: Since the signing of the NPT in 1968, the international community has acted to reduce the number of nuclear weapons. When the Soviet Union fell, it and the United States and were working to reduce their arsenals. The trend had been growing for decades because, in the words of the late Mexican diplomat Miguel Marín-Bosch, nuclear weapons "do not enhance a country's security but, rather, imperil the survival of all nations." And the chances of nuclear-weapons use increase as the number of nuclear-capable countries rises. In the words of the political scientist Kenneth Waltz, "[m]ore is therefore worse." This equation drives the global push for the control and nonproliferation of nuclear weapons to this day, from North Korea to Iran, as it did in 1994.

There is a saying in the intelligence world that decision-makers can only make decisions with the information available to them at that moment. They cannot see the future but still have to safeguard their countries' future and think about possible outcomes. When it comes to the Budapest Memorandum, working within the confines of the historical moment following the collapse of the Soviet Union and the politically complex situation, there is no doubt the leaders of Russia, Ukraine, the United Kingdom, and the United States made the correct choice not to keep Ukraine as a nuclear-capable country in 1994.

Ukraine could have become a target for bad actors

or other states intent on obtaining nuclear materiel or weapons. It is not simply a matter of Ukraine not being safe today because it did not keep its nuclear weapons. At the time it took the decision, not only did it not have operational control of its nuclear arsenal, it also lacked any experience in controlling it and the budget to operate even the TU-160 bomber jets it inherited. Ukraine had inherited not a traditional army, but an enormously powerful military without, as James Sherr writes, "a Ministry of Defence, without a General Staff and without central organs of command-and-control." Without a capable military imbued with the knowledge of its own nuclear program, its stockpile would have constituted not a deterrent or safeguard for newly independent Ukraine but a large danger to itself and the world.

Nuclear weapons would not have made a newly independent Ukraine safer—in 1994, world leaders knew this and acted with an eye toward the future with the Budapest Memorandum. And, while many factors have led to the current crisis between Russia and Ukraine, fortunately the actions of decision-makers in the past have at least safeguarded this crisis from being a confrontation between nuclear-capable countries.

Thus, newly independent Ukraine could have become a target for bad actors or other states intent on obtaining nuclear materiel or weapons. It is even not inconceivable that Russia would have at some point attempted to retake the Soviet arsenal that had been left in the country.

Budapest Memorandum Support in Action: Russia violated the Budapest Memorandum by annexing Crimea in 2014, claiming that it was protecting ethnic Russians there. A similar situation is playing out currently in Donbas as Russia recognizes the breakaway Donetsk and Luhansk "People's Republics" as independent.

But, although the Budapest Memorandum did not include a mechanism for enforcing the security of Ukraine's borders, and Russia has disregarded it and may soon do so again, the United States and the United Kingdom have stood by the commitments they signed in 1994. The United States has spent billions of dollars training the country's armed forces and provided it with over 90 tons of military aid. The United Kingdom has sent hardware and advisors to support Ukraine. Meanwhile, the European Union has sent varying levels of support to the country, demonstrating the commitment to help it stay independent.

This Budapest Memorandum support is not trivial. While Ukraine may not enjoy a guarantee of military commitment like a NATO member, the support given to the country has bolstered its military as a modern warfighting force that has been trained by many other premier global militaries. What Ukraine traded away in 1994, it has regained in the form of international recognition and military support.

Ukraine's position is a tough one; stuck between NATO and Russia, its decisions must be carried out with utmost care. All leaders know that future implications of their decisions are a burden they must carry. Nuclear weapons would not have made a newly independent Ukraine safer—in 1994, world leaders knew this and acted with an eye toward the future with the Budapest Memorandum. And, while many factors have led to the current crisis between Russia and Ukraine, fortunately the actions of decision-makers in the past have at least safeguarded this crisis from being a confrontation between nuclear-capable countries.

Source:https://www.gmfus.org/news/despite-threat-it-faces-ukraine-was-right-give-its-nuclear-weapons, 22 February 2022.

OPINION – Beatrice Fihn

Putin's Nuclear Option

The end of the Cold War led to a miraculous moment in nuclear disarmament. As the Soviet Union collapsed, persistent diplomatic maneuvering led to the removal of Soviet strategic nuclear weapons stationed in Belarus, Ukraine

and Kazakhstan, as well as tactical nuclear weapons from all Soviet republics. But 30 years later, those gains are now threatened to be reversed, heightening the nuclear threat to its greatest level since the Cuban Missile Crisis in 1962.

Ever since Russian President Vladimir Putin recognized the Donetsk and Luhansk regions in the Donbass as independent states, in violation of the U.N. Charter and international law, the conflict's looming nuclear backdrop has been making its way to the forefront — providing a timely, and frightening, reminder of the importance of moving quickly to limit the risk of irreversible catastrophe.

That Putin was joined by Belarusian President Aleksander Lukashenko to watch the Russian military carry out a nuclear weapons exercise earlier this week was no coincidence. The two men have been moving toward an agreement that could redraw Europe's nuclear map. Putin has increasingly grown more belligerent on the nuclear weapons front, showing a disregard for international law and promoting dangerous escalation. Lukashenko, meanwhile, is turning words in to action, with a referendum that could change the constitution of Belarus to allow nuclear weapons on Belarusian territory.

Lukashenko has also said Belarus would be open to hosting Russian nuclear weapons, and Russian officials have declared their intention to do just that if NATO deploys weapons further east, or if Ukraine joins the alliance.

Russia and Belarus are not alone in their aggressive and irresponsible posture either. The United States continues to exploit a questionable reading of the NPT that prevents states from "possessing" nuclear weapons but allows them to host those weapons. Five European states currently host approximately 100 U.S. nuclear weapons: Belgium, the Netherlands, Germany, Italy and Turkey — even though public opinion strongly opposes these deployments. Suddenly, the "unthinkable" is unfolding before our eyes. This is how a regional conflict turns into a global nightmare.

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A good summation of nuclear weapons' conventional wisdom for decades has been: trust that cooler heads will prevail. In the past, leaders of European countries shrugged their shoulders as Nobel-winning organizations, like the International Campaign to Abolish Nuclear Weapons, the International Committee of the Red Cross and the United Nations, warned about the catastrophic humanitarian consequences and increasing risks of nuclear weapons use.

We are now seeing that it is not a gamble we should be taking with the fate of the world. To put this all in context, new deployments of nuclear weapons in Eastern Europe could station U.S. and Russian nuclear weapons closer than at any time in history. This would not be a second Cuban Missile Crisis but a far more volatile situation.

There is, fortunately, a clear path to de-escalation and disarmament. First, the international community must strongly condemn Russia's violations of international law and stand firmly behind Ukraine's right to sovereignty. Lukashenko must also change course and respect the will of the Belarusian people who want their nation's non-nuclear status to remain codified in the constitution.

But these alone are not enough. All countries in Europe, from Russian allies like Belarus to U.S. allies in NATO, should sign the binding UN treaty

called the TPNW, which entered into force last year, and commit to never be a part of using, possessing or hosting weapons of mass destruction.

The current crisis reminds us that states that develop nuclear weapons are not the only ones impacted by the current threat. There is no such thing as a "limited nuclear war," and any use of nuclear weapons in Europe would draw in dozens of nations. There is no health care or emergency response capacity to deal with such consequences — not in any of the nuclear-armed states nor any international organization.

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The treaty does, however, close loopholes in the NPT and empower non-nuclear-weapon countries to take concrete action to promote disarmament and ensure their nations will never host these banned weapons. Hope and trust in a handful of bellicose leaders is not a concrete strategy to prevent this crisis from becoming a nuclear catastrophe — but this treaty could be. We urgently need diplomatic action based on international law that holds on to disarmament gains made at the close of the Cold War and expands on them. We need it now.

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Source: https://www.politico.eu/article/putins-nuclear-option/, 24 February 2022.

OPINION – Daryl Kimball

Putin's War of Aggression on Ukraine and the Non-proliferation Regime

President Vladimir Putin has chosen the path of destruction instead of diplomacy. His months-long build-up of a massive Russian invasion force encircling Ukraine and his decision on February 21 to order Russian soldiers into the eastern Ukrainian provinces of Luhansk and Donetsk have set in motion a catastrophic war. Putin's indefensible, premeditated assault on Ukraine will heighten tensions between NATO and Russia, increase the risk of conflict elsewhere in Europe, and undermine prospects for nuclear non-proliferation and disarmament—for years to come.

There are many grievances fuelling Putin's latest and most brazen attempt to reset the post-Cold War European security order through military force. Some are real, such as the effect of NATO's expansion on the military balance in Europe, and some are imagined. No rationale, however, justifies a violent attack by Russia on one of its neighbors.

In an angry speech announcing his decision to move Russian forces into Ukraine, Putin espoused wild, ethno-racialist, and historically inaccurate claims that Ukraine is not a legitimate state and belongs within a greater Russia. He voiced hyperbolic claims that an independent, westward-leaning Ukraine, which he falsely charged might even build nuclear weapons, is a grave threat to Russia.

Putin's aggression against Ukraine violates the 1994 Budapest Memorandum in which Russia, the United Kingdom, and the United States extended security assurances against the threat or use of force against Ukraine's territory or political independence.

In response, Ukraine acceded to the NPT as a non-nuclear-weapon state and gave up the 1,900 nuclear warheads it inherited from the Soviet Union. Ukraine, Russia, and the world were safer as a result. But Putin's behavior undermines the NPT and

reinforces the impression that nuclear-armed states can bully non-nuclear states, thus reducing the incentives for disarmament and making it more difficult to prevent nuclear proliferation.

The vicious cycle of mistrust between Russia and the West in recent years has been exacerbated by the loss—through negligence, noncompliance, or outright withdrawal—of important conventional and nuclear arms control agreements that helped end the Cold War. These guardrails included the Conventional Forces in Europe Treaty, which was designed to prevent major force buildups on the continent; the Open Skies Treaty, which provided transparency about military capabilities and movements; the Anti-Ballistic Missile Treaty, which was designed to prevent an unconstrained offense-defense arms race; and the Intermediate-Range Nuclear Forces Treaty, which reduced the danger of nuclear war in Europe.

As a result, cooperation between the parties has eroded, concerns about military capabilities have grown, and the risk of miscalculation is higher. With Putin's deadly war against Ukraine now underway, the United States, Europe, and the international community must maintain a strong and unified response, including more powerful sanctions against key Russian institutions and leaders. The besieged people of Ukraine require urgent assistance from the international community. As it should, the Kyiv government will get defensive military assistance to deter Putin from seizing more, if not all, of its territory.

In the days and weeks ahead, leaders in Moscow, Washington, and Europe must be careful to avoid new and destabilizing military deployments, close encounters between Russian and NATO forces, and the introduction of offensive weapons that undermine common security. For example, the offer from Russia's client state, Belarus, to host Russian tactical nuclear weapons, if pursued by Putin, would further undermine Russian and European security, and increase the risk of nuclear war.

Although Putin's regime must suffer international isolation now, U.S. and Russian leaders must eventually seek to resume talks through their stalled strategic security dialogue to defuse broader NATO-Russia tensions and maintain common sense arms control measures to prevent an all-out arms race.

Russia's December 2021 proposals on security and the Biden administration responses show there is room for negotiations to resolve mutual concerns, including agreements to scale back large military exercises and prevent the deployment of intermediate-range missiles in Europe or western Russia. Washington must test whether Russia is serious about such options.

In the long run, U.S., Russian, and European leaders, and their people, cannot lose sight of the fact that war and the threat of nuclear war are the common enemies. Russia and the West have an interest in striking agreements that further slash bloated strategic nuclear forces, regulate shorter-range "battlefield" nuclear arsenals, and set limits on long-range missile defenses before the last remaining nuclear arms control agreement, New START, expires in early 2026. Otherwise, the next showdown will be even riskier.

Source: https://www.indepthnews.net/index.php/opinion/5104-putin-s-war-of-aggression-on-ukraine-and-the-non-proliferation-regime, 24 February 2022.

OPINION – Shekhar Gupta

Why Buddha would be Frowning at Ukraine Today, and why India Got it Right with Pokhran 1 and 2

Would it have been so simple for Putin's Russia to crush Zelenskyy's Ukraine if it hadn't given up its nuclear stockpile in 1994? India was prescient to declare itself a nuclear-armed state. Why was the code to inform Indira Gandhi of the successful Pokhran-1 nuclear test 'Buddha is smiling'? While you think about it, let's switch to Ukraine.

By the time you are reading this, Kyiv would have capitulated. The question that's been asked often in the past few days, and will continue to echo for decades to come is, would it have been so simple for Putin's Russia to crush Zelenskyy's Ukraine if it hadn't given up its nuclear stockpile after the

Budapest accord in 1994. This was done in return for security guarantees by the US, Europe and Russia. One of the guarantors has now invaded Ukraine; one, Europe, is looking for a place to hide and ruing its possible loss of cheap gas; and the third, the US, is doing no more than pour tender love and care. Would Ukraine be such a pushover if it had that stockpile?

Now, let's turn this question inwards at ourselves. Was India prescient or imprudent to not only build nuclear weapons but to declare itself a nuclear-armed state? Over the decades, this has seen a robust debate among four schools. One, the Homi Bhabha-era hawks who believed India should have built its nukes in the early sixties, even pre-empting China. Former foreign secretary Maharajakrishna Rasgotra had even stated in public interviews and seminars that President John F. Kennedy had offered to help India develop and detonate a device, but that Jawaharlal Nehru turned him down.

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The Second School is the Opposite: Nuclear weapons are ugly, immoral, unusable, unnecessary and an affront to humanity. That school has faded lately, especially after Pokhran-2 in 1998. Some of it has morphed into a new thought process: Now that nuclearisation is a done deal, let's work to keep it to minimum deterrence and be active and willing members of all global arrangements, including CTBT of sorts.

The third believes that India was better served by nuclear ambiguity. That Indira Gandhi had already shown the world our capability in 1974 with Pokhran-1. The 1998 tests were unnecessary political chest-thumping that gave Pakistan the opportunity to test as well. As a result, South Asia had two self-declared nuclear weapon states.

The fourth is the team that won. That mere demonstration of capability in 1974 was not enough. It was self-inflicted double defeat. India exposed itself to sanctions, yet did not assert itself as a weapons power. To call this Peaceful Nuclear Explosion (PNE) was pure hypocrisy that impressed none. Not even India's public opinion at a juncture when Mrs Gandhi needed desperately to shore it up. It was essential to weaponise, thump our chests, throw the gauntlet at Pakistan.

The first school did not find much purchase in the fraught 1960s, and the second was rendered irrelevant after 1998. The third and fourth need to be debated, particularly with the Ukraine staring us in the face. Similar questions were also raised when the US invaded Iraq twice, the second time on the pretext that it had nukes. Would Bush senior or junior have risked invading Iraq if it actually had any WMDs?

Never mind that it wouldn't have the wherewithal to send them to Washington. But just the threat of a nuclear reprisal for the invasion against any of the US's Middle-Eastern allies would have done. Ukraine now has become an enduring advertisement for the WMD-sovereignty link. It is making many nations, comfortable today in the aura of guarantees, uncomfortable. Surely, no country with the nukes now, or one that's nearly there — North Korea, Israel, Iran or any other — will ever give these up. They will remember Ukraine.

Did India gain or lose from opening its nuclear cupboard and exposing its wares to the world? The criticism is that it enabled Pakistan to find formal parity. The answer is, nobody had any doubt that Pakistan was already a nuclear weapon state. The Americans had given their last certificate of what was often called "nuclear virginity" to Pakistan in 1989, and refused to renew it.

In the 1990-91 stand-off, Pakistan had also employed the nuclear blackmail against India. It is something books have been written about (Bob Winderm and William Burrows, Critical Mass: The dangerous race for super weapons in a fragmenting world), then-CIA deputy chief Robert Gates has spoken about it, and investigative journalist Seymour Hersh has written a detailed piece too. I too have explained it in several of my writings since.

But, the Pakistani threat, which Robert Gates also brought to India from Islamabad on his conflict resolution visit, was that they will use the nukes in the beginning of the war. The reality dawned on V.P. Singh's government that India did not have an immediately deliverable weapon in retaliation. Over the decades, proven capability had not been developed into a credible weapon and delivery systems. That crisis passed, but this had ended any doubts across our political spectrum, with all its divisions, that India needed the weapons fast.

That baton passed brilliantly between seven prime ministers across a decade of political instability. And in 1998, Pokhran-2 happened, followed by Pakistan's tit-for-tat in Chagai. Two decades after that, where did the two new nuclear powers stand? India mostly accepted as a legitimate nuclear weapons power, admitted to most multilateral arrangements, rid of all the sanctions and an American strategic ally. And Pakistan? It wasn't such a bad idea to open the cupboard then.

Eighteen March 1989 is a significant day in Indian strategic evolution. Intelligence reports were now confirming that Pakistan was indeed a screwdriver's turn away from a deliverable bomb. On this day, the IAF was holding it customary firepower demonstration, this one involving 129 aircraft, at Tilpat, a firing range not far from Delhi. At the demonstration, Rajiv gestured to top civil servant Naresh Chandra to follow him into a tent. He was so secretive he even shook off a curious Rajesh Pilot, then a minister. There, he told Chandra of his concern and assigned him to head an elite group, mostly of scientists, to take India to full weaponisation. I wrote about it in some detail in these 2006 articles.

The group included top nuclear scientists R. Chidambaram, P.K. Iyengar, Anil Kakodkar, K. 'Santy' Santhanam, missile specialist A.P.J. Abdul Kalam and then-DRDO chief V.S. Arunachalam. They were to be funded mostly covertly out of a fund for "science and technology" under the Planning Commission. A lot of the operations were undercover and covert. Santhanam, for example, was given a discrete senior posting in RAW. Kakodkar later disclosed to me in this Walk the Talk on NDTV that he had to even travel overseas under assumed names and passports.

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Finally, here's why they said 'Buddha is smiling' for Pokhran-1. It seems that sometime in the epoch of Buddha, the ancient kingdom of Magadh launched a war of conquest over its neighbour Vaishali. While Magadh was the usual monarchy that built a big army and collected the weapons for the assault, Vaishali was some kind of an anarchic street democracy where people spent all their time arguing over whether to fight, how to fight, who will fight.

Sure enough, Magadh annihilated and massacred poorly armed Vaishali. When the news got to a meditating Buddha, it seems, he frowned in disapproval. Meaning that to keep the peace, a kingdom has to be fully prepared for war, or it will meet Vaishali's fate. Since 1964, India was the Vaishali to China's Magadh. Now you know why Buddha would now be smiling? Or why he would be frowning at Ukraine's fate?

Source: https://theprint.in/national-interest/why-buddha-would-be-frowning-at-ukraine-today-and-why-india-got-it-right-with-pokhran-1-and-2/848441/, 26 February 2022.

OPINION – Tom Nichols

How Ukraine could become a Nuclear Crisis

The Russian invasion of Ukraine is not a nuclear crisis. Yet. Concern about the role of nuclear weapons is perfectly understandable, however, now that a paranoid dictator has led Russia into a major war in the middle of Europe, attacking a country that shares a border with four of America's NATO allies. A nuclear crisis is unlikely, but not impossible.

The Russian invasion of Ukraine is not a nuclear crisis. Yet. Concern about the role of nuclear weapons is perfectly understandable, however, now that a paranoid dictator has led Russia into a major war in the middle of Europe, attacking a country that shares a border with four of America's NATO allies. A nuclear crisis is unlikely, but not impossible.

The Russians are going to defeat the overmatched Ukrainians, and they do not need nuclear weapons to do it. And while Vladimir Putin is, in my view, unhinged and reckless, I see no indication that he is seeking war with the United States or NATO. Nonetheless, there are multiple paths to a dangerous nuclear confrontation that could embroil Moscow and Washington in a situation neither of them expects or wants.

The least likely occasion for a nuclear crisis would be if Russian forces directly and intentionally threaten NATO territory. All of the Atlantic alliance, including the United States and its nuclear arsenal, would be required to come to the aid of the nations in danger. This is the doomsday scenario that NATO was created to prevent, and it would come about only if Putin were seized by an even greater madness than the one driving him to war in Ukraine. If Putin were to decide, for example, that his great crusade to roll back the collapse of the Soviet Union should include recapturing the Baltic states or driving NATO forces from Poland, he would effectively be declaring World War III and throwing the entire world into the abyss. But, again, there is no evidence that Putin intends to take this path.

A far more likely possibility would be a crisis arising from an accident. War is always a risky and unpredictable affair, even when one side is far stronger than the other. Human beings and their machines make mistakes, sometimes with dire results. In 2015, Turkey, a NATO nation, shot down a Russian jet that had strayed over the Turkish border. Two years ago, during the crisis between Iran and the United States after U.S. forces killed Qassem Soleimani, the Iranians shot down a commercial airliner —from Ukraine, no less—in their own country. And let us not forget that the Russian forces now on the march belong to the same military that in 2014 managed to screw up and shoot down a commercial airliner over Ukraine while claiming that it wasn't even there in the first place.

There are countless opportunities for such errors in the chaos now overtaking Ukraine. The Russians might shoot at NATO aircraft after misidentifying them. Or they might incorrectly believe that Russian aircraft have been attacked by NATO forces. They might suffer a misfire or a targeting error of some kind that puts Russian ordnance on NATO territory. Europe's a crowded continent, and no place for a jumpy trigger finger, but accidents are an unavoidable part of warfare.

Any one of these mishaps could lead the Russians, or the United States, or both, to increase the alert status of their nuclear arsenals. This would mean that nuclear weapons and their crews—in some cases, with missiles that are already capable of being launched in 15 or 20 minutes—would heighten their vigilance and readiness to proceed with their missions. Such alerts are rare, and for good reason: They move us one step closer to nuclear conflict.

Finally, there is the frightening possibility that Putin will increase the alert status of his nuclear

forces for his own reasons, leaving the Americans no choice but to raise their alert status. The invasion of Ukraine was preceded by the Russian Grom (meaning "thunder") drills, a regular exercise held by Russia's strategic nuclear forces. The timing was no accident; Putin relies on Russia's nuclear deterrent as one of its last claims to superpower status, and he could activate another such exercise, or call for a heightened alert condition, if he thinks things are going poorly for Russia.

The invasion of Ukraine was preceded by the Russian Grom (meaning "thunder") drills, a regular exercise held by Russia's strategic nuclear forces. The timing was no accident; Putin relies on Russia's nuclear deterrent as one of its last claims to superpower status, and he could activate another such exercise, or call for a heightened alert condition, if he thinks things are going poorly for Russia.

Perhaps Russian forces, for example, end up taking more casualties than Putin expected, and he wants to blame the West rather than admit the incompetence or errors of his own commanders. He might then use nuclear signaling as a way of creating a narrative for his people that the West is somehow threatening Russia and that he is determined to stand up to Washington. Or he may be paranoid enough to believe that the U.S. and NATO are planning to send forces in to aid the Ukrainians. Or he may simply decide on such an alert merely to bare his teeth if he thinks it might stop the supply of arms and aid to Ukraine.

Such tit-for-tat signaling has happened before. In 1973, when the Soviet Union threatened to send troops into the middle of the Yom Kippur War to save Egyptian forces from destruction by the Israelis, the United States raised its level of nuclear preparedness, its DEFCON, or "defense condition," as a way of indicating American resolve to prevent a Soviet intervention. The Soviets and the Americans for decades poisoned the air and oceans with nuclear tests that were meant to show strength and determination.

In an escalating-alert-level scenario, each side will start watching the other intensely for evidence of an impending attack. All of the gremlins of error and miscalculation that are already on the loose in Ukraine now will become existential hazards until the crisis—which at that point will be about the United States and Russia, instead of Ukraine—is somehow sorted out.

None of this—we must hope—is likely. And it is needlessly anxiety-producing, even unhealthy, to spend too much time pondering the chances of a nuclear confrontation. But it is imprudent to pretend that the weapons do not exist at all. Nuclear weapons helped keep the peace in the first Cold War. Sadly, we must hope they will do so again in this new, second cold war declared by the Russian president.

Source: https://www.theatlantic.com/ideas/archive/2022/02/how-ukraine-could-become-nuclear-crisis/622915/, 25 February 2022.

NUCLEAR STRATEGY

NATO

France Says Putin Needs to Understand NATO has Nuclear Weapons

France's foreign minister said that Russian President Vladimir Putin, when making threats about using nuclear weapons, needs to understand that NATO, too, is a nuclear alliance, but he ruled out NATO-led military intervention to defend Ukraine. Asked whether Putin's threat of "such consequences that you have never encountered in your history" was tantamount to threatening Russian use nuclear weapons in the Ukraine conflict, Foreign Minister Jean-Yves Le Drian said it was indeed understood as such.

"Yes, I think that Vladimir Putin must also understand that the Atlantic alliance is a nuclear alliance. That is all I will say about this," Le Drian said on French television TF1. Speaking from the Kremlin he launched the Russian military's invasion of Ukraine, Putin said Russia would respond instantly if any external force tried to

interfere with its actions. "Whoever tries to hinder us, and even more so, to create threats to our country, to our people, should know that Russia's response will be immediate. And it will lead you to such consequences that you have never encountered in your history," the Russian president said.

...Asked why NATO member states — which in past decades have intervened militarily in non-NATO countries such as Afghanistan, Libya and former Yugoslavia — are refusing to put soldiers on the ground in Ukraine, Le Drian said: "That is not what the Ukrainians are asking us". He said Ukraine is asking for humanitarian and financial help, as well as military equipment, which the West has provided and will continue to provide. Asked what weaponry NATO could provide, Le Drian said "they have made a list and we are studying that list in order to meet their requests as soon as possible". Asked whether Europe and NATO could continue to rule out a military response despite the presence of Russian soldiers in Ukraine and Putin's threat of nuclear apocalypse, Le Drian said sanctions will be more efficient. ...

Source: https://www.reuters.com/world/europe/france-says-putin-needs-understand-nato-has-nuclear-weapons-2022-02-24/, 25 February 2022.

USA

Seawolf II? The US Navy's Plan for A New Attack Submarine

The US Navy needs a new attack submarine, or what is called the SSN(X). The Seawolf submarines could be the blueprint – The US Navy's Director of Undersea Warfare explained that the United States Navy's next attack submarines have to be extremely fast and quiet to be combat effective. And, in contrast to the versatile Virginia-class, the Navy's new attack submarines will have a blue-water, deep-sea focus.

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The Virginia-class "remains the most capable multi-mission submarine in the world – bar none," United States Navy Rear Adm. Doug Perry explained. "But we must maintain our undersea advantage by investing for future capabilities. And we know we need to start that work today to make sure we can deliver SSN(X) in time of need, and without lots of technical or schedule risk."

A report from the Congressional Budget Office, responsible for tracking federal costs, explains, "the next-generation attack submarine should be faster, stealthier, and able to carry more torpedoes than the Virginia class—similar to the Seawolf-class submarine. CBO therefore assumed that the SSN(X) would be a Seawolf-sized SSN, which displaces about 9,100 tons when submerged, and would have an all-new design in keeping with the Navy's description of it as a "fast, lethal, next-generation attack submarine."

The Legendary Seawolf-Class: The Seawolf-class is small — just three subs in total — curtailed by the end of Cold War hostilities. Yet, at the time, they were some of the most advanced submarines in existence, able to dive deeper than most other submarines and capable of higher speeds than other American or Soviet submarines.

The class recently made headlines when one of the class struck an underwater seamount in the South China Sea, severely damaging the submarine's bow section and likely its sonar array. The submarine, the USS Connecticut, was forced to sail to Guam and later the American west coast for repairs.

As a blue-water platform, the Navy's new attack submarines will pack a great deal of weaponry on board, optimized for hunting other submariners —

hearkening back to the Seawolf-class' original purpose: hunting down Soviet submarines. And like the Seawolves, they'll be expensive.

The Congressional Budget Office "estimates much greater costs for the SSN(X) than the Navy does.... On the basis of those assumptions, CBO estimates that the average cost of the SSN(X) would be $5.5 billion per submarine, whereas the Navy estimated the cost at $3.1 billion per submarine." The discrepancy is large, a difference of $72 billion.

In response to North Korea's recent missile tests, the Defence Ministry of South Korea announced on 17 February, that South Korea's military will strengthen the Air Force's missile defence unit by deploying equipment, which includes advanced radars and expanding its mission.

Towards a Super Seawolf-Class? In moving from a capable multi-mission platform with significant intelligence, surveillance, and reconnaissance abilities back to a potent deep-water submarine-hunting platform, the Navy is betting on a highly contested environment in an era of great-power competition.

Source: https://www.19fortyfive.com/2022/02/seawolf-ii-the-us-navys-plan-for-a-new-attack-submarine/, 26 February 2022.

BALLISTIC MISSILE DEFENCE

SOUTH KOREA

South Korea Strengthens Anti-Missile Unit Amid Rising Threats from North Korea

In response to North Korea's recent missile tests, the Defence Ministry of South Korea announced on 17 February, that South Korea's military will strengthen the Air Force's missile defence unit by deploying equipment, which includes advanced radars and expanding its mission. As part of attempts to improve the military's anti-missile capabilities, the ministry filed a public notice on its quest for legislation to restructure the current Air Defense Missile Command.

The command will receive more ballistic missile early-warning radars and mid-range surface-to-air missiles as part of the upcoming reorganisation, which is scheduled for April. South Korea's multilayered anti-missile programme includes the M-SAM system, dubbed "Cheongung II." In Korean, the term 'Cheongung' refers to the bow of heaven. In order to emphasise the command's anti-missile missions, the military plans to change its official name but it hasn't revealed a new name yet, according to Yonhap News.

Command will Monitor Operational Threats: The ministry stated that the command will monitor strategic and operational threats in the air in order to counter complex, wide-area, multi-layer missiles while simultaneously performing regional air defence missions. Analysts and observers have noted that the government is ready to deploy a long-range surface-to-air missile that was developed domestically. The command will also be entrusted with assisting the military in responding more effectively to threats from space.

The Army Missile Command will be renamed and its headquarters and subordinate units will be enlarged to form the Army Missile Strategic Command in April. Last month, North Korea launched seven missiles, including a hypersonic and intermediate-range ballistic missile, raising concerns about the South's ability to respond.

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South Korean President Calls for Diplomacy: In the meanwhile, talking about North Korea's

missile test South Korean President Moon Jae-in stated that if North Korea's repeated missile launches go so far as to violate Kim's self-imposed moratorium, the Korean Peninsula will be thrust back into the crisis situation of five years ago, when there were fears of war. He further stated that to avoid a repeat of this situation, political leaders from connected countries should participate in ongoing conversation and diplomacy.

The L-SAM, built by South Korea's Hanwha Group and LIG Nex 1, is intended to intercept high-altitude aircraft, as well as ballistic missiles in their terminal phase, up to an altitude of 60 kilometers. In South Korea's air defense network, that role is presently performed by THAAD.

Source: https://www. republicworld.com/world-news/rest-of-the-world-news/south-korea-strengthens-anti-missile-unit-amid-rising-threats-from-north-korea-articleshow.html, 17 February 2022.

South Korea Announces First Successful Test of L-SAM Air Defense System that Could Replace US THAAD

US deployment of the THAAD system to South Korea in 2017 aroused protest from China due to the system's powerful radar, which can reportedly scan across nearly all of China from the peninsula. South Korea's Agency for Defense Development test-fired a new high-altitude air defense system, according to Yonhap News Agency. The long-range surface-to-air missile (L-SAM) was launched for the first time from the Anheung Comprehensive Test Site in Taean-gun, southwest of Seoul. According to Korea News, the rocket flew along a preset path and did not attempt to engage a target. However, it performed as expected. The L-SAM, built by South Korea's Hanwha Group and LIG Nex 1, is intended to intercept high-altitude aircraft, as well as ballistic missiles in their terminal phase, up to an altitude of 60 kilometers. In South Korea's air defense network, that role is presently performed by THAAD.

The bevy of weapons are intended to form a layered defense against the ballistic missile and rocket artillery systems fielded by the DPRK, which are considerable. According to defense experts, the DPRK's newest road-mobile rocket artillery are designed to evade South Korea's air defense net, which, along with Pyongyang's nuclear weapons, have prompted Seoul to completely revisit its entire defense strategy.

However, THAAD has been criticized by China since it was first deployed to South Korea in 2017, because one of the settings on its powerful X-band AN/TPY-2 radar allows it to track an object "the size of a baseball from about 2,900 miles (4,600 kilometers) away," according to US officials. Locals have also fought the deployment of THAAD to their districts, saying it makes them targets.

... Other air defenses developed by South Korea in recent years include the KM-SAM or Cheolmae-2 system, built using technology borrowed from Russian arms makers Almaz-Antey and Fakel, which produce the 9696 missile used on the S-350E and S-400 air defense systems. South Korea has also worked to develop its own analogue to Israel's Iron Dome system, which LIG Nex1 unveiled in October as the low-altitude missile defense system (LAMD).

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The two nations have been at war since 1950, when cross-border incursions by both sides erupted into an all-out conflict. As the North appeared close to victory, the United States organized an international intervention force and joined the war on South Korea's side; later, Chinese volunteer forces supplemented North

Korean soldiers and pushed the Americans southward. The shooting war ended in 1953 in a stalemate and a ceasefire, but no permanent peace treaty. Several attempts at rapprochement have ultimately failed, as 28,500 US troops stationed in South Korea have ensured that Seoul does not stray too close to peace.

Source: https://sputniknews.com/20220224/south-korea-announces-first-successful-test-of-l-sam-air-defense-system-that-could-replace-us-thaad-1093347350.html, 24 February 2022.

USA

No US Missile Defense System Proven Capable Against 'Realistic' ICBM Threats: Study

A new study of US missile defenses has found that — after 70 years and some $350 billion in investment — no "system thus far developed has been shown to be effective against realistic ICBM threats" to the homeland. It's a conclusion with which the Pentagon's Missile Defense Agency begs to differ.

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The study by the American Physical Society (APS) examined a hypothetical North Korean strike and current missile defense systems, such as ground-based interceptors, as well as more futuristic options in development, like directed energy weapons and space-based interceptors. It found today's capabilities inadequate and future systems unlikely to do the job of defending the country in the next 15 years at least — even from a small number of North Korean missiles.

The study asserts that directed energy weapons for intercepting intercontinental ballistic missiles early in their flight will not be ready for prime time within that 15-year period. As for space-based interceptors (SBIs) — a concept revitalized during the Trump administration — the study finds that hundreds of on-orbit platforms would be needed to shoot down only one of North Korea's least capable ballistic missiles.

"Creating a reliable and effective defense against the threat posed by even the small number of relatively unsophisticated nuclear-armed ICBMs that it considers remains a daunting challenge," the Feb. 9 APS report, called "Ballistic Missile Defense: Threats and Challenges" finds. APS is a non-profit membership organization for physicists and scientists in related fields, founded in 1899. The study was conducted by a panel that includes a number of scientists who are known for their support of nuclear arms control. The panel was chaired by Frederick Lamb, a physics professor at the University of Illinois who has had a long career in national security and arms control, including advising the Defense Department.

"The difficulties are numerous, ranging from the unresolved countermeasures problem for midcourse-intercept to the severe reach-versus-time challenge of boost-phase intercept. Few of the main challenges have been solved, and many of the hard problems are likely to remain unsolved during, and probably beyond, the 15-year time horizon the study considered. The costs and benefits of this effort therefore need to be weighed carefully" the APS study concludes.

In particular, the study asserts that directed energy weapons for intercepting intercontinental ballistic missiles early in their flight will not be ready for prime time within that 15-year period. As for space-based interceptors (SBIs) — a concept revitalized during the Trump administration — the study finds that hundreds of on-orbit platforms would be needed to shoot down only one of North Korea's least capable ballistic missiles.

Officials from the Missile Defense Agency (MDA) contested the study's conclusions, however,

pointing Breaking Defense to the most recent report by the Pentagon's top testing official, the Director of Operational Test and Evaluation (DOT&E). That report found that, taken together, the various missile defense programs are capable of doing what they are designed to do. "The Missile Defense System (MDS) has demonstrated a measured capability to defend the United States, deployed forces, and allies from a rogue nation's missile attack," the DOT&E report said.

The More Things Change: Many of the APS report's findings echo those of a number of studies by outside scientists over the past two decades. In addition, the Government Accountability Office does an annual audit of the all the missile defense elements that consistently has cited a lack of sufficient testing across many of the various missile defense efforts. Despite large and continued investment, missile defense programs have not been fully proven as capable of protecting the US from ICBMs.

Missile Defense Agency officials, industry representatives and advocates for missile defenses over the years have made their own consistent arguments: that these external studies have relied on outdated and, because of classification restrictions, inaccurate data. They also consistently have pointed out that there are constraints on realistic testing for a number of reasons such as safety, and that testing parameters have been more than sufficient to prove capability.

In the same vein, Missile Defense Agency officials, industry representatives and advocates for missile defenses over the years have made their own consistent arguments: that these external studies have relied on outdated and, because of classification restrictions, inaccurate data. They also consistently have pointed out that there are constraints on realistic testing for a number of reasons such as safety, and that testing parameters have been more than sufficient to prove capability.

In response to questions from Breaking Defense, MDA officials stressed that senior US military leaders in recent years have pronounced the current homeland missile defense system as fully ready and capable against a North Korean attack — including Strategic Command head Adm. Chas Richard, Northern Command head Gen. Glen VanHerck and former Vice Chairman of the Joint Chiefs of Staff Gen. John Hyten.

Most recently, VanHerck told reporters at the Pentagon in September that if North Korea were to launch a missile, NORTHCOM is "ready 24/7, 365," adding "I'm confident in our capabilities".... It considered the capabilities of the US Ground-based Midcourse Defense (GMD) system; the planned Next Generation Interceptor (NGI); the Navy's ship-based Aegis system originally designed to intercept short-, medium-, and intermediate-range ballistic missiles that is now being considered for midcourse-intercept of ICBMs; the Army's THAAD system; and potential boost-phase systems using either hit-to-kill or directed energy. The study found issues with each.

GMD: Effectiveness 'Likely to Be Low,' Study Co-Author Says: "Due to its fragility to countermeasures, and the inability to expand it readily or cost-effectively, the current midcourse intercept system cannot be expected to provide a robust or reliable capability against more than the simplest attacks by a small number of relatively unsophisticated missiles within the 15-year time horizon of this report," the study says.

...In response, MDA spokesperson Robert Carver told Breaking Defense that since 2017, "the GMD system has been tested twice in operationally realistic scenarios against ICBM target threats. These tests used a total of three Ground Based Interceptors against two ICBM target missiles and successfully intercepted both."

Carver said it was "important to note" that in those cases the ICBMs used countermeasures designed to thwart the ground-based interceptors, "which were still able to identify the Reentry

Vehicles (the ICBM target missile warhead) and successfully destroy both."

DOT&E also pronounced GMD as fit for purpose in the January report. The system "has demonstrated the capability to defend the U.S. Homeland from a small number of ballistic missile threats with ranges greater than 3,000 kilometers and employing simple countermeasures, when supported by the full architecture of Missile Defense System (MDS) sensors," the report said.

MDA intends to supplement (not replace) the current arsenal of 44 GMD interceptors with 21 Next Generation Interceptors, as well as build another 10 for testing, with a life-time price tag of $18 billion.

NGI: Still in Development as MDA Aims for 2028 Operations: MDA intends to supplement (not replace) the current arsenal of 44 GMD interceptors with 21 Next Generation Interceptors, as well as build another 10 for testing, with a life-time price tag of $18 billion, Grego explained. She noted that "if rigorous engineering procedures are followed" by MDA prior to fielding, "some of the previous design and reliability problems" that have plagued GMD can be avoided. "However, even if those improvements are made, the issue of effectively discriminating warheads from decoys remains unsolved," she added.

Carver stressed that NGI, which was initiated to counter North Korean advancements in missile tech, is still in development. "NGI will meet warfighter operational need for accelerated emplacement" no later than the fourth quarter of fiscal 2028, he said. Due to the laws of physics, numerous space-based interceptors would be required to hit one incoming ballistic missile, according to a new study by the American Physical Society. (APS graphic)

The study concludes that "all these systems," whether based on land, at sea, in the air or in space, "would face very difficult technical challenges" and "be unable to defend the entire continental United States.

Boost-phase Interceptors: Long Time 'Til 'Technically Feasible': The study concludes that "all these systems," whether based on land, at sea, in the air or in space, "would face very difficult technical challenges" and "be unable to defend the entire continental United States." In particular, Lamb told the webinar, laser weapons for boost-phase intercept "based on aircraft, drones or space platforms will not be technically feasible within the 15 year time horizon of this study."

Further, he said, a space-based interceptor system would require "at least 400 orbiting interceptor platforms" to counter a single, liquid-fueled North Korean missile; and to counter 10 such missiles launched within a short time period, "at least 4,000." And because solid-fueled missiles are "more demanding" a challenge, he said, intercepting just one would require 1,600 SBIs. Victoria Samson of the Secure World Foundation applauded the work on SBIs, noting that the study had been careful to take into account technology developments over the past two decades.

"I know that boosters of SBI would argue that the launch costs have improved so much that the limitations brought up in the older studies are no longer relevant, but this is not the case," she said in an email. "The physics is still the same: if we want coverage of a specific region, orbital mechanics requires a certain number of interceptors on orbit to ensure that that coverage is provided." While MDA continues to research directed energy, along with the military services who are bullish on the promise of using lasers to counter drones, the agency's director, Vice Adm. Jon Hill, has actually expressed caution himself about applying them to boost-phase intercept. "I think it's pretty far away," he told the Heritage Foundation in 2020, according to a report in Defense Daily.

Source: https://breakingdefense.com/2022/02/no-us-missile-defense-system-proven-capable-against-realistic-icbm-threats-study/, 22 February 2022.

EMERGING TECHNOLOGIES AND DETERRENCE

USA

Powering Maneuvers in Space

Space nuclear propulsion can support longer missions and make U.S. satellites more resilient and maneuverable. America's national security satellite constellations were designed at a time when space was an uncontested domain. Their design maximized mission efficiency, life span and reliability, while providing only limited maneuverability and countermeasures. These mostly large, monolithic systems deliver tremendous mission functionality but fly predictable orbital paths, making them easy targets for enemy attacks. Like U.S. B-52 bombers over Hanoi during the Vietnam War, flying the same altitudes and flight paths day in and day out makes them sitting ducks for an enemy seeking to stop the overflights.

In today's increasingly contested operational environment, the United States must revamp its space force design and warfighting strategy so it can conduct maneuver warfare in orbit and beyond. Doing so would enable the U.S. military to take deliberate measures to deter, avoid, and defeat threats—to field an active defense in space—instead of simply allowing its passive constellations to absorb attacks until they fail.

In today's increasingly contested operational environment, the United States must revamp its space force design and warfighting strategy so it can conduct maneuver warfare in orbit and beyond. Doing so would enable the U.S. military to take deliberate measures to deter, avoid, and defeat threats—to field an active defense in space—instead of simply allowing its passive constellations to absorb attacks until they fail.

The U.S. satellites supporting civilian and national security missions today employ chemical or electric propulsion to maintain their orbits and make limited maneuvers to steer out of the paths of incoming objects. Because satellites carry only small amounts of chemical propellant, fuel must be used judiciously, as with aircraft that must limit speed to increase range. Satellites typically use chemical-powered thrusters to maintain orbit, adjust their position, or deorbit after mission completion. Electric propulsion, while more efficient than chemical propellants, is too slow for the kinds of maneuver operations the U.S. Space Force needs to ensure operations in the face of threats in space.

To better maneuver in space, a more powerful and fuel-efficient means is needed, and nuclear energy offers a compelling solution. Space Nuclear Thermal Propulsion (SNTP) is a high-thrust system that heats hydrogen as a propellant. It is the nuclear equivalent of a chemical rocket but more efficient, enabling the spacecraft to fly longer missions with less propellant. Space Nuclear Electric Propulsion (SNEP) is a low-thrust alternative that consists of a nuclear reactor to generate electricity to power the spacecraft and a slow, but fuel-efficient propulsion system. Nuclear electric power systems could also power space weapons, such as lasers.

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Both technologies are safe and could provide a maneuverable satellite force that is more survivable and capable, with both defensive and offensive benefits.

The Technology: SNTP technology was developed and matured from the 1960s to the 1980s, but never operationalized. Absent a threat to make it necessary, there was no need to rapidly maneuver on orbit. Today, however, China's strategy of maneuver warfare in space, built on both space- and ground-based

weapons, changes the dynamic. By 2040, in fact, China is planning to deploy space vehicles powered by nuclear thermal propulsion. Just as mechanized armor transformed the battlefields in World War I, rendering horse cavalry obsolete, the ability to maneuver in space will be transformational.

Nuclear thermal propulsion will be critical to counter China's anti-satellite weapons. While SNTP can't match the thrust generated by chemical rockets, it can conduct longer, more efficient engine "burns," producing higher velocity and more rapid maneuvers. SNTP can support longer, more complicated missions from a single vehicle and operate for years in space without needing to be refueled.

Unlike nuclear weapons, SNTP reactors are essentially a heater; they contain no explosives and remain in a "cold, subcritical state" until the reactor is turned on for a prolonged period in space. The relatively low radioactivity of un-fissioned Uranium-235 is comparable to radioactivity found in natural sources on Earth such as soil, rocks, and water.

SNTP engines can also deliver the velocity and maneuverability needed to conduct maneuver operations in space with great efficiency—bottom line, they can operate with less "propellant" than their chemical counterparts and therefore can operate for longer mission times. SNTP engines use fission to generate heat. The higher the engine's temperature, the greater the thrust and propellant efficiency (or specific impulse). Advanced ceramic composites under development may be able achieve even greater impulse and thrust-to-weight ratios that are already possible today.

When all factors are considered, nuclear thermal propulsion systems are more than twice as fuel efficient as chemical propulsion systems. Uranium-235 has an energy density 4 million times greater than hydrazine, a common chemical propellant for satellite thrusters. While the mass of the hydrogen propellant is comparable to the mass of a chemical rocket's propellant, the combined mass of SNTP's hydrogen propellant plus its nuclear reactor is less than that of the chemical propellant plus its combustion chamber. At the end of the day, nuclear thermal propulsion systems are more than twice as fuel efficient as chemical propulsion systems, able to generate the same thrust with half the mass. How much thrust? More than 100,000 Newtons, or enough to accelerate an automobile from 0 to 60 miles per hour in 0.3 seconds. This is the kind of responsiveness necessary to maneuver in Earth orbit, between orbits, and in cislunar space.

Safety is, of course, a primary concern. Unlike nuclear weapons, SNTP reactors are essentially a heater; they contain no explosives and remain in a "cold, subcritical state" until the reactor is turned on for a prolonged period in space. The relatively low radioactivity of un-fissioned Uranium-235 is comparable to radioactivity found in natural sources on Earth such as soil, rocks, and water. Once deployed above 750 km, the reactor poses no hazard to Earth and runs only during thrust operations—typically only several minutes at a time. SNTP engines generate no radioactivity when not in use, and whatever fission products do escape from the reactor during those short bursts are harmlessly dispersed into the vast expanse of space.

Concerns about an SNTP reactor plunging back to Earth in a failed launch are mitigated by launching the nuclear space vehicle from conventional rockets over water and following a launch path that minimizes risk. Further, the reactor's design ensures that inadvertent criticality events cannot occur—even in the event of a crash into the ocean.

The Defense Advanced Projects Research Agency's Demonstration Rocket for Agile Cislunar Operations (DRACO) is testing the propulsion efficiency of low-enriched uranium (LEU) reactor engines, which do not require presidential authorization. But even if high-enriched uranium (HEU) cores must be used in a given application, that extra step provides a final safety check.

The Threat: Both China and Russia have long recognized the vulnerabilities of conventional satellite constellations. To exploit those weaknesses, China is developing a multi-layered counterspace architecture. Starting with radio-

frequency jammers and illumination lasers that can temporarily debilitate satellites, its approach adds additional threats: weapons that can permanently degrade and even destroy satellites, such as ground-launched ASAT missiles and directed energy weapons like high-power lasers. Russia is developing similar capabilities and recently demonstrated its ability to strike a satellite in orbit. Gen. James H. Dickinson, who heads U.S. Space Command, said Russia's November 2021 ASAT demonstration made clear that it is "deploying capabilities to actively deny access to and use of space by the United States and its allies and partners."

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Understanding how limited fuel affects spacecraft operations, adversaries have designed strategies to degrade U.S. satellite mission life spans by forcing operators into defensive maneuvers that deplete onboard chemical propellant. Even though a satellite may still function in every way, once it's out of fuel, it can no longer maintain its orbit and becomes operationally useless.

Military and commercial space operators are already experiencing the contested space environment. Purposeful jamming of space-based assets and their communication links to ground stations is now routine. Space-faring allies, including France, have experienced adversary spacecraft approaching within visual range or closer, without warning or coordination.

China's strategy in space differs greatly from the U.S. perspective approach. While the U.S. bases its deterrence on the threat of force, China has made clear that it intends to preemptively use force to coerce and prevent adversaries from intervening against its operations. China's "attack to deter" concept, which appears in some of their space doctrine, such as The Science of Military Strategy, among others, relies on rapidly maneuvering to exploit an adversary's weak points and achieve psychological and physical effects:

Disruption. This could include pre-conflict operations such as jamming and blinding an adversary's intelligence satellites with lasers. In a more advanced state of crisis, China could escalate to include simultaneous kinetic strikes.

Preemption. China's doctrine seeks to "create psychological fear … and have an influence on … national decision-makers" to achieve its strategic objectives—before war is officially declared.

Dislocation. If an attack to deter fails to achieve its desired result, China's strategy calls for "destructive strikes to the enemy [in space] … in order to fight rapidly, conclude the operation rapidly, and to withdraw from the confrontation."

According to publicly available sources, China continues to expand its operational counterspace weaponry, including ground-launched missiles carrying ASAT kinetic kill vehicles and space electronic warfare capabilities. Its PLA has demonstrated kinetic ASAT weapons that threaten U.S. space systems in LEO, medium-Earth orbit, and GEO and has operational units equipped with radio-frequency jamming to disrupt satellite communications, precision navigation and timing, missile warning, and other vital space systems. The PLA is developing and testing weapons that can rendezvous with orbiting U.S. satellites and observe or attack them electronically or with on-board robotic arms.

Why Now? Military and commercial space operators are already experiencing the contested space environment. Purposeful jamming of space-based assets and their communication links to

ground stations is now routine. Space-faring allies, including France, have experienced adversary spacecraft approaching within visual range or closer, without warning or coordination. While these reconnaissance activities could be benign, it is more likely they are preparatory efforts for more aggressive actions. Like the posturing of naval craft at sea or aircraft near sovereign airspace, such maneuvers can be intended to intimidate or incite a defensive response. Such threats alter U.S. military operating assumptions and demand new capabilities in response.

The Department of Defense's 2020 Defense Space Strategy describes China as the "most immediate and serious threat" to U.S. national security objectives in space. This strategy argues that a more resilient national security space architecture is needed to counter emerging threats. Resiliency measures include the development of satellite constellations that can absorb limited kinetic and nonkinetic attacks and continue to provide critical services to U.S. air, land, and sea forces worldwide—in other words, constellations with enough nodes that there is no single point of failure. Most current constellations include just a few large, monolithic satellites, which can be easily targeted. Enemy attacks that eliminate a relatively small number of satellites in these constellations could greatly disrupt the overhead surveillance, global communications, and other capabilities they provide.

Proliferated LEO satellite constellations offer an alternative by deploying hundreds or thousands of small satellites to form a "mesh" network above the atmosphere. Having so many satellites means none can become a single point of failure, making the system more resilient to attack. Denying enemies the ability to inflict a quick, knockout blow is exactly what force designs like this are intended to achieve.

Yet this alone does not solve the problem. First, some missions do not lend themselves to this approach. And second, even small satellites follow predictable orbits. China asserts that both traditional and proliferated constellations are "easy to attack and difficult to defend." Without enhanced maneuverability, DOD's push to field larger numbers of satellites per constellation may simply provide more targets, rather than targets that are harder to destroy. As Chinese and Russian military space and counter-space operations continue to mature, the ability to rapidly maneuver across orbits and even into cislunar space—the region between GEO and the moon—will become increasingly critical to U.S. security interests.

Without enhanced maneuverability, DOD's push to field larger numbers of satellites per constellation may simply provide more targets, rather than targets that are harder to destroy. As Chinese and Russian military space and counter-space operations continue to mature, the ability to rapidly maneuver across orbits and even into cislunar space—the region between GEO and the moon—will become increasingly critical to U.S. security interests.

Today, satellites with limited chemical propellants can take weeks to months to maneuver across orbital regimes. The USSF must address its maneuver disadvantages, change its forces, and alter the way they operate to get ahead of emerging threats, rather than wait for adversaries to fully mature them. This will require the Space Force to field new space vehicles with SNTP technologies. Otherwise, China's pursuit of nuclear thermal and nuclear electric propulsion vehicles and other weapons systems will give them a major advantage in space maneuver warfare.

Maneuverable space forces must be part of a multi-tiered force design that also includes proliferated constellations and hardened systems. Even in a proliferated constellation, there is a tipping point, beyond which operations are seriously degraded; likewise, hardening against radiation, lasers, or the limited use of nuclear weapons in the upper atmosphere and in space protects against certain threats. Adding maneuver expands the options available to commanders and increases U.S. flexibility in space. This is especially important in satellite constellations that are critical national resources and can increase defensive and offensive options, such as GPS and

ISR satellite constellations. Whether guiding precision munitions or keeping power plants operating, GPS provides precision navigation and timing data used throughout our economy. ISR satellites operating in LEO and GEO are similarly vital, providing critical information used by military operations and farmers alike. Nuclear thermal propulsion can ensure those capabilities are always available when needed.

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Conclusion and Recommendations: Traditional resiliency measures are no longer sufficient to protect and defend against adversaries that believe rapid and destructive space warfare will be part of future great power conflicts. Following these six steps will help ensure U.S. forces in space are capable of defensive and offensive maneuver operations in the future:

· DOD should adopt a new space force design capable of decisive maneuver warfare in space. Without the ability to rapidly maneuver, DOD's disaggregated and proliferated LEO systems will only provide additional targets for Chinese and Russian kinetic and nonkinetic counterspace weapons systems. DOD's 2020 Defense Space Strategy is a good start to address changing threats, but it does not go far enough.

· DOD, in partnership with NASA and the Department of Energy, should develop and field SNTP and other technologies that will increase their ability to deter and defeat threats against the U.S. national security space architecture. After nearly 70 years of development, experimentation, and testing, now is the time to operationalize SNTP space systems.

· Beginning in fiscal 2024, the Biden administration and Congress should move DARPA's DRACO program from science and technology development to a full acquisition program of record. Doing so will help DOD operationalize space maneuver warfare before America's strategic competitors.

·DOD should deploy ground-based and space-based kinetic ASAT weapons systems capable of holding Chinese and Russian targets at risk. This will provide U.S. leadership with near-term options to deter and defend against anti-satellite threats. DOD could achieve this objective by repurposing existing initiatives, including its standard missile and ground based mid-course missile defense interceptor programs.

· DOD should hedge against risk by deploying the mission extension vehicle (MEV) to provide GPS and other vital satellite constellations the ability to conduct limited defensive maneuvers while preserving their onboard chemical propellant.

Construction of unit 8 at the Tianwan nuclear power plant in China's Jiangsu province officially got under way on 25 February with the pouring of first concrete for the reactor's nuclear island. The unit is one of four VVER-1200 reactors to be supplied by Russia to China under a 2018 agreement.

· The U.S. Space Force must educate the public and Congress on the growing threat to U.S. space systems and the need to create a more robust force design that will enhance deterrence. SNTP can help create a much-needed agile maneuvering force capable of generating a wide range of defensive and offensive effects in, from, and to space at a time and place of our choosing.

Source: https://www.airforcemag.com/article/powering-maneuvers-in-space/, 17 February 2022.

NUCLEAR ENERGY

CHINA

Construction Starts on Eighth Tianwan Unit

Construction of unit 8 at the Tianwan nuclear power plant in China's Jiangsu province officially got under way on 25 February with the pouring of

first concrete for the reactor's nuclear island. The unit is one of four VVER-1200 reactors to be supplied by Russia to China under a 2018 agreement.

In June 2018, Russia and China signed four agreements, including for the construction of two VVER-1200 reactors as units 7 and 8 of the Tianwan plant. In addition, two further VVER-1200 units were to be constructed at the new Xudabao (also known as Xudapu) site in Huludao, Liaoning province.

The Tianwan plant is the biggest example of Russian-Chinese economic cooperation, Rosatom said. The first two Tianwan units are Russian-built VVER-1000 reactors, which have been in commercial operation since 2007. Three years later, Rosatom and China National Nuclear Corporation (CNNC) signed a general contract for the construction of the next stage of the Tianwan project - units 3 and 4, which entered commercial operation in 2018.

Work on Tianwan 7 and 8 and Xudabao 3 and 4 was launched on 19 May last year at a ceremony attended via video-link by Chinese President Xi Jinping and Russian President Vladimir Putin. The ceremony included the pouring of first concrete for Tianwan 7. Russian state nuclear corporation Rosatom announced today that a ceremony had now been held at the construction site of Tianwan 8 to mark the pouring of first concrete.

"The documentation prepared by the engineers of the St Petersburg Design Institute of Atomenergoproekt JSC and handed over to the Chinese customer made it possible to start the concrete pouring procedure according to the schedule"....

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In March 2019, a ceremony was held in Beijing to sign a general contract for the construction of Tianwan units 7 and 8. Under this project, an intergovernmental agreement and a framework contract were signed for the construction of VVER-1200 reactors. In accordance with this, Rosatom will design the nuclear island and supply the key equipment, as well as provide nuclear fuel for both units. The units are scheduled to be commissioned in 2026-2027.

"Cooperation between Russia and China in terms of nuclear power plant construction has been going on for more than a decade," noted Alexei Bannik, Vice President for Projects in China at ASE. "We know and appreciate each other as effective partners, good friends and assistants in the implementation of the most important strategic projects. Now we are working on the implementation of new contracts - four of the most powerful generation 3+ VVER-1200 units should be connected to the Chinese power system in the coming years. The design and delivery of the equipment is already being carried out actively and without any interruptions. We have the most important construction work ahead of us."

Source: https://www.world-nuclear-news.org/Articles/Construction-starts-on-eighth-Tianwan-unit, 25 February 2022.

FRANCE

Hit with High Natural Gas Prices, France Vows to Build More Nuclear Energy

The threat of war in Ukraine coupled with the supply chain crunch is causing France to consider

expanding its nuclear energy program. It will build as many as 14 nuclear reactors by 2050 — not just to resist natural gas shortages but also to battle climate change. Construction could begin in 2028.

Natural gas prices have spiked in Europe while Russia is amassing troops along its Ukrainian border, forcing Europe to potentially ban Russian natural gas. As for France, it wants to fall back on an energy source that is both carbon-free and reliable — one that has provided at least 70% of its electricity since the 1970s.

"What our country needs ... is the rebirth of France's nuclear industry," French President Emmanuel Macron said in a speech. He has also committed to increasing France's share of offshore wind energy and solar power while extending the lives of current nuclear units. High natural gas prices and idled nuclear power plants have forced France to use more coal this winter.

By 2050, the world population will expand by 40%, and the energy demand will at least double. Debate abounds over the most efficient and cleanest way to deliver that power. No doubt, onsite generation that uses renewable electricity can make a dent, particularly in places without energy access. But in global regions with developed infrastructures, low-carbon power plants that run 24/7 are more efficient.

By 2050, the world population will expand by 40%, and the energy demand will at least double. Debate abounds over the most efficient and cleanest way to deliver that power. No doubt, onsite generation that uses renewable electricity can make a dent, particularly in places without energy access. But in global regions with developed infrastructures, low-carbon power plants that run 24/7 are more efficient.

Once a nuclear plant is built, it is inexpensive to run and produces no greenhouse gas emissions. In the United States, those plants provide 20% of the electricity and more than half of its carbon-free power. Globally, nuclear energy makes up about 10% of the electricity pie, and there are 452 operating plants. Nuclear energy and hydropower provide 75% of the world's low-carbon energy.

According to the International Energy Agency in Paris, electricity generated by nuclear energy should be doubled from 2020 to 2050. It's critical to hitting net-zero — especially in Europe, aiming to cut those emissions by 55% by 2030, from a 1990 baseline. Critics counter that the money is better off going to build out green energy programs. "The nuclear fleet in advanced economies is 35 years old on average and many plants are nearing the end of their designed lifetimes," says a report by the International Energy Agency. "Given their age, plants are beginning to close, with 25% of existing nuclear capacity in advanced economies expected to be shut down by 2025."

France had committed itself to nuclear energy in the 1970s when much of the world was hesitant. That's been a policy that has enjoyed support from most French citizens, who have opted to pry themselves loose from energy exporters. However, after the Japanese nuclear accident in 2011, France set out to critically evaluate its nuclear energy program.

France had committed itself to nuclear energy in the 1970s when much of the world was hesitant. That's been a policy that has enjoyed support from most French citizens, who have opted to pry themselves loose from energy exporters. However, after the Japanese nuclear accident in 2011, France set out to critically evaluate its nuclear energy program. French regulators have said that all of the units passed muster and that none should be closed. They did say, however, the current security techniques must be continually enhanced.

China is driving growth in the global nuclear sector. It plans to build 150 new reactors by 2050 — an effort that will cost $440 billion. More than 40 nuclear plants are now under construction there.

China is industrializing faster than any country on Earth. By reducing emissions and improving quality of life, China hopes to become a magnet for new investment. It is attracting the likes of Samsung, Siemens, and Philips.

Third-generation and third-generation-plus reactors are going up mainly in China and India. Fourth-generation reactors are in the research and development phase. A primary impediment to building more nuclear energy is the high cost of construction. Just ask Southern Co., whose Vogle units have been way over budget; it is building two third-generation AP-1000 Westinghouse reactors. China, though, offsets those risks by securing almost all loans.

In free-market economies, energy technologies should stand on their own. And environmentalists point to the high costs and the difficulty of finding a long-term storage site. They add that public resources would be better spent advancing renewable energy solutions. But just as France is recommitting itself to nuclear energy, other industrialized countries may also conclude the same — that generating carbon-free power and escaping Russia's clutches are paramount.

Source: https://www.forbes.com/sites/kensilverstein/2022/02/15/hit-with-high-natural-gas-prices-france-vows-to-build-more-nuclear-energy/?sh=5820d14d8f7a, 15 February 2022.

JAPAN

Japan Sees Nuclear Energy as A Vital Piece of its Net-Zero Plan

Prior to the Fukushima disaster, nuclear power accounted for almost 30% of Japan's energy mix, though it has since dropped to just 6.2% Japan is looking to reboot its nuclear industry, seeing it as a vital component in its net-zero ambitions. Japan is the world's second-largest LNG importer, and if it does not reduce its reliance on LNG imports, it is likely to face higher levels of energy instability

As climate change becomes an increasingly pressing issue, governments worldwide have stepped up efforts towards decarbonization. Japan aims to reduce its greenhouse gas emissions by 26% from 2013 levels by 2030. Leveraging nuclear energy could help Japan meet this goal, a fact understood by the administration of Prime Minister Kishida Fumio. However, the government faces an uphill battle in the shadow of the 2011 Fukushima nuclear disaster.

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However, safety concerns and public backlash in the immediate aftermath of the Fukushima disaster led the government to shut down all the country's nuclear power plants by May 2012. Though some plants have resumed operation since then, nuclear energy currently accounts for only around 6.2% of Japan's energy mix.

Japan's Energy Ambitions: Prior to the Fukushima disaster, nuclear power generation accounted for almost 30% of Japan's energy mix. However, safety concerns and public backlash in the immediate aftermath of the Fukushima disaster led the government to shut down all the country's nuclear power plants by May 2012. Though some plants have resumed operation since then, nuclear energy currently accounts for only around 6.2% of Japan's energy mix. To make up for the nuclear shortfall, Japan stepped up imports of natural gas; liquified natural gas (LNG) imports jumped 12,621 thousand tonnes between 2010 and 2011. At the time of writing, Japan is the world's second-largest LNG importer behind China and the third-largest importer of coal behind India and China.

Positively, renewable energy's share of Japan's energy mix has increased steadily in recent years, reaching a share of 18% in 2019. The government

anticipates that renewable energy will account for at least 36% of Japan's energy mix by 2030. PM Kishida's administration also aims to leverage Japan's nuclear infrastructure to help achieve carbon neutrality by 2050, hoping to have nuclear energy take up between 20-22% of the energy mix by 2030. Even so, continued public opposition and post-Fukushima reforms make it unlikely that Japan will be able to meet this 2030 target.

Public Opinion: A decade on from the Fukushima disaster, the Japanese public continues to view nuclear power with suspicion, as the results of a 2020 survey by the Japan Atomic Energy Relations Organization (JAERO) indicate. Questioned about their perception of nuclear power, 61% of the 1200 respondents considered it dangerous. When asked about their stance on nuclear energy policy, 48% felt that while nuclear energy should be used for the time being, it should be phased out gradually. Another 8% took a firmer position, arguing that Japan should abandon nuclear power as soon as possible. Taken together, these statistics are discouraging for the Japanese government's plan to return nuclear power's share of the energy mix closer to that which it enjoyed pre-2011.

Major public events such as the Olympics draw great public interest and receive intense media attention. A terrorist attack involving nuclear or other radioactive material could result in severe consequences, depending upon the specific material involved, the mode of dispersal, the location and the population impacted.

Illustrating the impact which local communities can have on the nuclear restart process, in March 2021 an Ibaraki district court ordered the suspension of the Tokai 2 nuclear power plant, citing insufficient disaster readiness measures, following a lawsuit filed by 224 residents of Ibaraki, Tokyo and Chiba. Prior to the decision on Tokai 2, 7 other lawsuits were filed with similar initial outcomes barring nuclear power plants from operating. Though many of these were overturned on appeal, dealing with ongoing public opposition constitutes an additional cost and delay to the government's efforts.

Regulatory Changes: Post-Fukushima reforms to Japan's nuclear regulatory framework have also contributed to the languishing restart process. The Nuclear Regulation Authority (NRA) established after the disaster enjoys a far greater degree of independence than its predecessor, the Nuclear and Industrial Safety Agency (NISA), insulating it from government or industry pressure. While this is beneficial for ensuring nuclear safety, some scholars have argued that the NRA's communication with plant operators is ineffective and that some of the Authority's safety goals are excessive. As a result, delays and increased review costs have slowed the recovery of Japan's nuclear industry.

Related to this, power plant operators face significant costs in complying with the NRA's safety requirements. The NRA's regulations include measures to respond to an intentional attack (such as by terrorists or a missile) and steps to prevent damage to a reactor's containment vessel. Implementing these conditions across 28 of Japan's nuclear plants would cost, according to a 2018 examination of reports, approximately 4 trillion yen (about USD $35 billion).

Farewell, Fission? Faced with growing costs and uncertainty about the prospects for plant operation in the face of lawsuits and regulatory inspections, Japan's power companies have increasingly decided to divest themselves of nuclear power stations. Of Japan's 57 existing reactors, 24 are set to be decommissioned whereas only 3 new reactors are under construction. Under the current system whereby nuclear plants may not operate for more than 60 years, it is likely that more reactors will be decommissioned in the next decade, presuming this limitation is not relaxed.

Overall, it is unlikely that nuclear power will account for 20% of Japan's energy mix by 2030 as the government hopes. In fact, it is not an exaggeration to state that if the current state of affairs continues, Japan's nuclear infrastructure

is quite likely to atrophy significantly. Such an outcome would place at risk not only Japan's climate ambitions but its national security.

As a resource-poor nation, nuclear power is a reliable source of energy which reduces Japan's dependence on imports from other countries; energy independence serves to secure freedom of action and reduce the impact of external shocks. Recent tensions surrounding Russia and Ukraine underscore the risks inherent to Japan's LNG import dependence. Worries about the possibility of Russia cutting off its supply of gas to Europe if conflict erupts resulted in US President Joe Biden requesting Japan divert some of its imported LNG to Europe, potentially challenging Japan's ability to respond to sudden domestic gas demand. A European conflict would push gas prices up further, straining Japanese finances.

IAEA would conduct the review and assist Japan before, during and after the release, which is planned to begin approximately two years after the basic policy announcement. After the two sides agreed on the project's Terms of Reference, the IAEA sent a team to Japan in September to begin implementation of the multi-annual review.

Japan's reliance on LNG also endangers other parts of the economy, as price spikes caused by events like unexpected cold spells (as occurred in early 2021) squeeze the finances of both consumers and firms. If Japan does not reduce its reliance on LNG imports, it is likely to face higher levels of energy instability as LNG demand continues its global growth trend and climate change leads to more unpredictable temperature shifts. The decline of Japan's nuclear industry would also jeopardize decades of accumulated research and expertise. With neighbors like China investing more into cutting-edge nuclear technology, abandoning nuclear energy would put Japan at a competitive disadvantage and result in the loss of skilled workers in the field. Though the Fukushima disaster exposed fatal flaws in Japan's nuclear energy sector, admirable progress has been made over the last 10 years to rectify those weaknesses; neglecting nuclear power now is likely to cost Japan dearly in the future.

Source: Tom Whipple, https://daily.energybulletin.org/2022/02/japan-sees-nuclear-energy-as-a-vital-piece-of-its-net-zero-plan/?utm_source= rss &utm_medium=rss&utm_campaign=japan-sees-nuclear-energy-as-a-vital-piece-of-its-net-zero-plan, 25 February 2022.

PAKISTAN

Pakistan Plans 40,000MW Nuclear Energy by 2050 to Meet Electricity Demands

The 1100MW unit K-3 of Karachi nuclear power plant recently became operational. Pakistan is on its way to adapting to zero-emission clean energy with a planned nuclear power generation capacity of 40,000 MW by 2050. The country has envisaged a nuclear power generation capacity of 40,000MW under its Nuclear Energy Vision 2050 with a total of 32 nuclear power plants to meet one-fourth of the country's energy needs.

PM's special assistant on climate change Malik Amin Aslam has said that Pakistan intends to adapt to the zero-carbon emission goal by 2050 in energy by utilizing all types of renewable and low-carbon sources. "We will make optimal use of our wind, hydel, solar and nuclear resources to meet the goals set by COP26 recently held in Glasgow," he said. Pakistan has planned a massive clean energy transition to shifting energy production away from fossil fuels to clean sources such as hydro, wind, solar and nuclear power that release little to no greenhouse gases.

K-3 Unit of Karachi Power Plant: On February 21, 1100MW unit K-3 of the Karachi nuclear power plant (KANUPP) became operational. The new unit will soon be connected to the national grid and begin commercial operation to provide clean and affordable electricity to millions. In March 2021, Pakistan connected its first 1100MW nuclear power plant unit to the national power grid.

Pakistan has six operational nuclear power stations and the successful addition of K-3 would significantly improve the country's nuclear power

generating capacity. The new units would help meet the electricity demand, which is around 25,000MW in the summertime peak and 12,000MW in the winter.

Pakistan's Energy Mix: Pakistan's current energy mix is formed of about 58 per cent fossil fuels, 30 per cent hydropower and 10 per cent renewables and nuclear power. However, the country has tremendous potential for producing renewable energy, which is being explored extensively. Prime Minister Imran Khan has vowed that by 2030 Pakistan would produce 60 per cent of its electricity from renewable sources. ...

Source: https://www. wionews.com/world/president-moon-calls-nuclear-power-main-source-of-electricity-over-next-60-years-456499, 25 February 2022.

URANIUM PRODUCTION

USA

US Uranium Producers Begin Preparations

The last quarter of 2021 saw production at only three US uranium facilities, but producers are making preparations with a view to starting production from operations in Wyoming and Utah as the market strengthens. For much of 2020 and 2021, the US Energy Information Administration (EIA) was unable to publish quarterly domestic uranium production figures as output failed to reach its reporting threshold.

The last quarter of 2021 saw production at only three US uranium facilities, but producers are making preparations with a view to starting production from operations in Wyoming and Utah as the market strengthens. For much of 2020 and 2021, the US Energy Information Administration (EIA) was unable to publish quarterly domestic uranium production figures as output failed to reach its reporting threshold. Figures have been published for the last two quarters, and according to the EIA's latest report, the fourth quarter of 2021 saw a total of 9,978 pounds U3O8 (3.8 tU) produced from three facilities: the Nichols Ranch in-situ leach (ISL) project and Ross central processing plant, both in Wyoming, and the Crowe Butte operation in Nebraska. This was 88% higher than the third quarter total of 5,297 pounds.

"2022 begins with the highest uranium price in a decade and a positive global outlook for nuclear energy not seen in a generation," Amir Adnani, CEO of Uranium Energy Corp (UEC) told shareholders. The Texas-based company's USD112 million acquisition of Uranium One Americas (U1A) from Rosatom's Uranium One Group, completed in December, means it now has two production-ready 'hub and spoke' in-situ leach platforms with processing facilities in Wyoming and South Texas, as well as four fully installed wellfields, six additional permitted or development-stage satellite ISL projects, and a portfolio of "under-explored" projects, he said.

During 2022, he said, the company will work to file updated technical reports on its new projects. In Wyoming, pairing UEC's Reno Creek ISL project with the Irigaray processing plant - part of the U1A acquisition - is anticipated to provide "significant" capital savings and operating synergies. An operational review for the potential capacity expansion of the Irigaray Plant to accommodate satellite production at the fully permitted Ludeman and Moore Ranch projects is also planned for this year.

In March 2021, UEC made its initial purchases under an initiative to build strategic inventory of physical uranium. The inventory will support future marketing and production efforts, accelerate cashflows and bolsters the company's balance sheet as uranium prices appreciate, Adnani said. The company's latest reported portfolio stands at 4.1 million pounds U3O8.

The company plans to expand capacity at the Hobson processing plant, which sits at the centre of its South Texas hub-and-spoke production platform, working towards amending its operation licence to increase production to four million pounds per year, doubling its current licensed capacity. The company also intends to advance the Burke Hollow ISL project "towards growth and production-readiness"....

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Meaningful Programmes: Consolidated Uranium on 17 February announced it was planning and implementing initial work at three past-producing US uranium projects, described by CEO Philip Williams as the first "meaningful project-level work programmes" in the company's history and "an important step in advancing these key US projects back toward production."

The Toronto-based company is working in conjunction with Energy Fuels, from whom it acquired the Tony M, Daneros and Rim mines in July 2021. The three conventional uranium mines, which are in Utah, are located near Energy Fuels' White Mesa mill, with which Consolidated has a toll-milling agreement.

Preparatory Work at Lance: 2022 is a "pivotal year" for Peninsula Energy as its prepares for a restart of operations at the Lance ISL project in Wyoming, the company's CEO Wayne Heili said on 17 February. The Australia-based company has allocated USD3.4 million for a programme of "early preparatory works" which it says would facilitate an accelerated restart of operations should a final investment decision be approved. The programme will include development work on a new mining area, the start of work to convert existing ISL facilities to low pH operation, and "limited" production operations at two existing mine units that were previously operated using alkaline ISL chemistry. Some portions of one unit - mine unit 2 - have already been restarted, with production streams going to the Ross plant for recovery of residual uranium.

Source: https://world-nuclear-news.org/Articles/US-uranium-producers-begin-preparations,

25 February 2022.

NUCLEAR PROLIFERATION

IRAN

Khamenei Says Iran Wants Nuclear Energy, Not Weapons, as Talks Progress

Iran's supreme leader, Ayatollah Ali Khamenei, has said Tehran needs nuclear energy, not weapons, amid signs of a breakthrough in long-running negotiations to revive a landmark atomic deal with world powers.

In comments aired by state television on February 17, the hard-line Khamenei, who holds ultimate religious and political authority in Iran, said Tehran "has to think about tomorrow" and that "sooner or later we will urgently need peaceful nuclear energy." Talks have been taking place in Vienna to revive the 2015 nuclear deal, known as the JCPOA, which came about because countries were worried Tehran was not being truthful about the aims of its nuclear program. Direct talks with Iran involve negotiators from Britain, China, France, Germany, and Russia. The United States is taking part indirectly, since Iran has refused to meet face-to-face with the U.S. delegation.

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Iran was targeted by increasingly tough sanctions by the United Nations, as well as the United States and other countries, before the deal with major world powers to curb Tehran's sensitive nuclear activities in exchange for sanctions relief in 2015. Then-President Donald trump pulled the United States from that deal in 2018 and reimposed stringent sanctions that battered Iran's economy and its currency.

Western diplomats said earlier that the talks to revive the JCPOA were in the final phase and they believe that a deal is within reach. ... "After weeks of intensive talks, we are closer than ever to an agreement; nothing is agreed until everything is agreed, though," Kani said. U.S. State Department spokesman Ned Price said the United States was in "the midst of the very final stages" of indirect talks with Iran aimed at salvaging the deal. "This is really the decisive period during which we'll be able to determine whether a mutual return to compliance with the JCPOA is in the offing, or if

it's not," Price said, using the acronym for the Joint Comprehensive Plan of Action. Iranian Foreign Minister Hossein Amir-Abdollahian said on February 14 that an agreement to restore the deal was "at hand" and told a news conference in Tehran that Iran was "serious and ready to reach a good agreement."

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Source: https://www.rferl.org/a/iran-nuclear-talks-tipping-points/31707804.html, 17 February 2022.

Iran MPs Put Forth Conditions for Reviving Nuclear Deal

Iranian lawmakers have laid out six conditions for the revival of the 2015 Iran nuclear deal with global powers in a letter to President Ebrahim Raisi published on 20 February. The letter, signed by 250 out of 290 parliamentarians, stated that U.S. and European parties should guarantee that they would not exit a restored agreement, nor trigger the "snapback mechanism" under which sanctions on Iran would be immediately reinstated if it violates nuclear compliance.

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The hardline-led parliament has not voted on the proposed conditions and Supreme Leader Ayatollah Ali Khamenei, who enjoys the support of hardliners, has the final say on Iran's nuclear policy and all other matters of state. "We have to learn a lesson from past experiences and put a red line on the national interest by not committing to any agreement without obtaining necessary guarantees first," lawmakers said in the letter.

The statement comes in the midst of final steps to revive a 2015 nuclear agreement in Vienna, which could lead to an agreement "very soon", according to a senior European Union official. Such conditions from lawmakers at a crucial time risk restricting Iranian negotiators' room for manoeuvre in Vienna and endanger a final agreement. The letter also said a return to the deal should only go ahead if all sanctions were lifted, including those pertaining to terrorism, missile technology and human rights.

In addition, lawmakers first want to confirm that Iran receives money from its exports, before the government returns to nuclear compliance, the statement added. After 10 months of talks in Vienna, one of the remaining differences is Iran's demand for a U.S. guarantee of no more sanctions or other punitive steps in the future, and also how and when to restore verifiable restrictions on Iran's nuclear activity.

A senior Iranian official has told Reuters that Iran has shown flexibility by agreeing to "inherent guarantees" as Washington says it is impossible for President Joe Biden to provide the legal assurances Iran has demanded. Iranian Foreign Minister Hossein Amirabdollahian said that a joint statement by the heads of the U.S. Senate and House of Representatives to back the nuclear deal would suffice as a "political guarantee". ...

Source: https://www.thehindu.com/news/international/iran-mps-put-forth-conditions-for-reviving-nuclear-deal/article65068689.ece, 20 February 2022.

NUCLEAR NON-PROLIFERATION

GENERAL

An Open Letter to the States Parties of the Nuclear Non-Proliferation Treaty

An Open Letter, urging nuclear weapons states to adopt no-first-use and other policies to ensure

a nuclear war is never fought was delivered to leaders of the "nuclear five" or N5 countries — China, France, Russia, the United Kingdom, and the United States (also known as the P5 because they are permanent members of the UN Security Council) — and to leaders of the other 185 countries which are States Parties to the NPT.

The Open Letter, entitled "Fulfil the NPT: From nuclear threats to human security," was organized by NoFirstUse Global, a global network of organizations, academics, policy makers and civil society advocates. It has so far been endorsed by over 1000 signatories from 69 countries, including former government ministers and ambassadors, parliamentarians and Nobel laureates, former military commanders and high level officials of the United Nations, and leading scientists, religious leaders, business leaders and representatives of civil society organizations from around the world.

The Open Letter calls on nuclear weapon states to: end the nuclear arms race by stopping nuclear weapons production; phase out the role of nuclear weapons in security policies starting with adopting no-first-use policies; commit to eliminating their nuclear weapons no later than 2045 – the 75th anniversary of the NPT; shift budgets and public investments from the nuclear weapons industry to supporting public health, climate stabilization, and sustainable development.

What the Nuclear Weapons States should Do: The Open Letter calls on nuclear weapon states to: end the nuclear arms race by stopping nuclear weapons production; phase out the role of nuclear weapons in security policies starting with adopting no-first-use policies; commit to eliminating their nuclear weapons no later than 2045 – the 75th anniversary of the NPT; shift budgets and public investments from the nuclear weapons industry to supporting public health, climate stabilization, and sustainable development.

Stop Playing with Fire! "First-use options are literally playing with fire in very combustible situations, and have nearly led to a nuclear war being initiated by mistake or miscalculation," the Open Letter states. "Unilateral no-first-use declarations, bilateral no-first-use agreements and/or a multilateral no-first-use agreement can reduce these risks....These can be followed by nuclear force restructuring and operational controls to implement no-first-use policies, and to build credibility and confidence in the policies to further reduce nuclear risks."

"And most importantly, the adoption of no-first-use or sole purpose policies could open the door to the nuclear armed states and their allies joining negotiations for the complete elimination of nuclear weapons." Last week the Bulletin of Atomic Scientists announced that its Doomsday Clock would remain set at 100 seconds to midnight for the third year in a row — closer to midnight than ever in its history – attesting to a continued high level of risk from today's nuclear arsenals and nuclear policies. The Open Letter will remain open for endorsement until August in preparation for a second presentation to the NPT States Parties at the 10th NPT Review Conference.

Source: https://globalsolutions.org/an-open-letter-to-the-states-parties-of-the-nuclear-non-proliferation-treaty/, 17 February 2022.

UKRAINE

Nuclear Weapon Delivery to Ukraine is Issue of Non-Proliferation, Not Desire

The issue of nuclear weapons delivery to Ukraine does not depend on the US desire or non-desire and is regulated by the Nuclear Non-Proliferation Treaty, Russian Foreign Ministry Spokeswoman Maria Zakharova said on 22 February.

The Russian diplomat thus commented on a statement by US Representative to the UN Linda Thomas-Greenfield. "This is not an issue of Ukraine's desire or non-desire. This is not even an issue of the US desire or non-desire. This is an issue of the Treaty on the Non-Proliferation of Nuclear Weapons whose parties both the United States and Ukraine are," the diplomat wrote on her Telegram channel.

Russian President Vladimir Putin said in his televised address to the nation on February 21

that Ukraine's statements on the possibility of creating its own nuclear weapons was not an empty bravado as Kiev possessed Soviet technologies and delivery vehicles for such weapons. The Russian president also said that technological support from abroad could also not be ruled out.

Source: https://tass.com/defense/1408155, 22 February 2022.

Ukraine's Nuclear Regret: A Look Back at when and why Kyiv Gave Up its Arsenal

This is not an issue of Ukraine's desire or non-desire. This is not even an issue of the US desire or non-desire. This is an issue of the Treaty on the Non-Proliferation of Nuclear Weapons whose parties both the United States and Ukraine are.

After the collapse of the Soviet Union, thousands of nuclear arms, about one third of the Soviet nuclear arsenal, were left on Ukrainian soil by Moscow. As Russia initiated a military operation against Ukraine on 24 February, the notes of regret couldn't be missed in the voice of Ukrainian MP Alexey Goncharenko as he recalled how his country gave up nuclear weapons in exchange for security guarantees from Russia and the US. "Ukraine is the only nation in the human history which gave up the nuclear arsenal, the third biggest in the world in 1994, with guarantees of the US, UK and Russian Federation. Where are these guarantees? Now we are bombed and killed," Goncharenko said while talking to Fox News. Ukraine's former defence minister Anriy Zahorodniuk also expressed regret at denuclearisation. "We gave away the capability for nothing," Why did the country with the "third biggest" nuclear arsenal in the world give it all up? What were the security guarantees from Russia and the US? Let's take a look back:

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Ukraine's Nuclear Arsenal: Once the second most powerful republic in the Soviet Union (USSR), Ukraine voted for independence on 1 December, 1991. With independence came the tag of being the third-largest nuclear power in the world, but only briefly. After the collapse of the Soviet Union, thousands of nuclear arms, about one third of the Soviet nuclear arsenal, were left on Ukrainian soil by Moscow.

According to the Federation of American Scientists (FAS), Ukraine had approximately 3,000 tactical nuclear weapons that are meant to hit large military facilities, naval fleets and armoured formations, and 2,000 strategic nuclear weapons that are meant to destroy cities. Despite having the third largest nuclear arsenal in the world, the authority to use the centralised firing control of these weapons remained in Moscow.

Ukraine's Denuclearisation under Budapest Memorandum: Extensive negotiations between Ukraine, Russia, the UK and the US led to an agreement called the Budapest Memorandum. As per the agreement, Ukraine agreed to dismantle its nuclear arsenal and delivery systems such as bombers and missiles with financial assistance from the West. Ukraine agreed to its accession to the Treaty on the NPT as a non-nuclear weapon State.

The agreement assured Ukraine that Russia, US and UK would refrain from threatening it and respect its "independence and sovereignty and the existing borders". The six paragraph-agreement also assured Ukraine that the other three signatories will "refrain from the threat or use of force against the territorial integrity or political independence of Ukraine, and that none of their weapons will ever be used against Ukraine except in self-defence or otherwise in accordance with the Charter of the United Nations".

It said that all the three signatories will not use economic coercion against Ukraine to secure advantages of any kind. The three countries agreed to seek immediate action from the United Nations Security Council to provide assistance to Ukraine if it becomes "the victim of an act of aggression or an object of a threat of aggression in which nuclear weapons are used".

The countries committed to not use nuclear weapons "against any non-nuclear-weapon State party to the NPT, except in the case of an attack on themselves, their territories or dependent territories, their armed forces, or their allies, by such a State in association or alliance with a nuclear-weapon State". All the four parties in the Budapest Memorandum agreed to consult "in the event a situation arises that raises a question concerning these commitments".

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Russia's Violation of Budapest Memorandum: Russian takeover of Crimea in Ukraine's territory in 2014 was considered a violation of the Budapest Memorandum. Putin, however, rejected the criticism calling the Budapest Memorandum invalid as it had been signed with a previous Ukrainian government. Putin earlier claimed that Ukraine was still in possession of Soviet nuclear technology and wanted to make its own nuclear weapons. "We know that there have already been reports that Ukraine wants to make its own nuclear weapons. This is no empty boast. Ukraine in fact still has Soviet nuclear technology and delivery systems for such weapons"....

Putin earlier claimed that Ukraine was still in possession of Soviet nuclear technology and wanted to make its own nuclear weapons. "We know that there have already been reports that Ukraine wants to make its own nuclear weapons. This is no empty boast. Ukraine in fact still has Soviet nuclear technology and delivery systems for such weapons"....

Source: https://www. firstpost.com/world/ukraines-nuclear-regret-a-look-back-at-when-and-why-kyiv-gave-up-its-arsenal-10406341.html, 24 February 2022.

NUCLEAR SAFETY

UKRAINE

Day after Seizing Chernobyl Nuclear Plant, Russia Claims Personnel Working at the Facility as Usual

The Chernobyl nuclear power plant's personnel are continuing to service the facilities and monitor the radiation situation at the station as usual, a top Russian official claimed on 25 February, a day after Russian forces took over the decommissioned facility after a fierce fight with Ukrainian soldiers guarding it.

Russian President Vladimir Putin on 24 February launched a multi-pronged all-out attack on Ukraine, casting aside international condemnation and sanctions and warned other countries that any attempt to interfere would lead to "consequences they had never seen". Russian forces took over the decommissioned nuclear power plant on 24 February after a fierce battle with the Ukrainian battalion guarding the facility, where nuclear radiation is still leaking from the world's worst nuclear disaster in 1986. Alyona Shevtsova, advisor to the commander of Ukraine's Ground Forces, in a Facebook Post said that Russian forces have taken over the power station and held the staff hostage.

"On February 24, Russia's paratroops put under control the territory around the Chernobyl nuclear power plant. An agreement was achieved with Ukraine's separate battalion guarding the country's NPP to jointly ensure the safety of nuclear reactors and the nuclear shelter," Russian Defence Ministry spokesman Igor Konashenkov was quoted as saying by state-run TASS news agency.

Konashenkov said the NPP personnel continued to service the facilities and monitor the radiation situation at the decommissioned plant as usual. An explosion at the Chernobyl plant in 1986 is the worst nuclear disaster in history. According to CNN, more than 30 people died in the immediate aftermath of an explosion that tore through Chernobyl's No. 4 reactor on April 26, 1986, near Pripyat, Ukraine. In the years that followed, countless others died from radiation symptoms, according to the International Atomic Energy Agency and the World Health Organization.

The Ukraine government evacuated some 135,000 people from the area and the 19-mile exclusion zone around the plant will remain uninhabitable for decades...

Warning the world of another such disaster, Ukraine's President Volodymyr Zelenskyy in a tweet said, "Our defenders are giving their lives so that the tragedy of 1986 will not be repeated." "This is a declaration of war against the whole of Europe," he said on 24 February.

According to a report in the BBC, the Ukrainian Ministry of Foreign Affairs also warned of the possibility of "another ecological disaster" at the site. Reports citing Ukraine's nuclear energy regulatory agency said that higher than usual gamma radiation levels have been detected in the area near the decommissioned plant. However, Konashenkov said that the radiation level in the area of the nuclear power plant did not exceed the natural background. "Joint measures by Russia's paratroops and the Ukrainian battalion responsible for guarding the nuclear power plant is a guarantee the nationalist groups and other terrorist organisations will be unable to use the current situation in the country for staging a nuclear provocation," he said.

Source: https://theprint.in/world/day-after-seizing-chernobyl-nuclear-plant-russia-claims-personnel-working-at-the-facility-as-usual/847701/, 25 February 2022.

IAEA Calls for Nuclear Plant Safety as Ukraine Crisis Intensifies

According to the IAEA's list, there are four operational nuclear power plants in Ukraine. The Ukrainian regulatory body told the IAEA that the country's operational nuclear power plants are all running safely. IAEA has expressed 'grave concern' regarding Russia's invasion of Ukraine and appealed to Russia to avoid any action that may imperil the safety of nuclear facilities in the country.

The appeal comes after Russia launched a full-scale military operation against Ukraine. In a statement, the international nuclear watchdog said that it is closely monitoring the evolving situation to ensure the safety of the nuclear power plants and other nuclear-related facilities in Ukraine. It added that the Ukraine regulatory body has said that the operational nuclear power plants are running safely. The IAEA also stated that all State Specialised Enterprise Chernobyl nuclear power plant (NPP) facilities had been captured by 'unidentified armed forces'.

There has so far been no damage to the facilities or casualties, the regulator added. IAEA director-general Rafael Mariano Grossi said: "It is of vital importance that the safe and secure operations of the nuclear facilities in that zone should not be affected or disrupted in any way.

"Any armed attack on and threat against nuclear facilities devoted to peaceful purposes constitutes a violation of the principles of the United Nations Charter, international law and the Statute of the Agency." The IAEA said that it remains in 'permanent contact' with its Ukrainian counterpart.

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There are currently four operational nuclear power plants in Ukraine. Earlier this week, Ukrainian government advisor Mykhailo Podolyak said that Russian forces had captured the Chernobyl nuclear power plant. This was later confirmed by the Russian Defence Ministry. As an intergovernmental agency, the IAEA facilitates scientific and technical cooperation in the nuclear field and encourages the peaceful use of nuclear technology. Last year, the agency completed a long-term operational safety review at the Ascó nuclear power plant in Spain.

Source: https://www.power-technology. com/news/iaea-nuclear-facilities-ukraine/, 25 February 2022.

USA

A Win for Proper Nuclear Safety

The Nuclear Regulatory Commission (NRC) took a momentous step in favor of the environment, health and public safety, as it ruled to reverse

course and said it will require a full environmental review before allowing the Turkey Point Nuclear Power Plant to operate for as long as 80 years.

Turkey Point sits just south of Miami, Florida, in between the natural wonders of Biscayne Bay and the Everglades. In 2018, the operators of the plant, Florida Power and Light Company (FPL), applied for a subsequent license renewal—permission to operate Turkey Point for 20 years past its current 60-year operating approval, or until the 2050s. The request was the first of an expected long line of aging reactors seeking to remain operating until mid-century and beyond. With its recent order, the NRC will now require all of these reactors to complete a full analysis before getting an extended lease on life.

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NRC staff and FPL had tried to squeak approval through for Turkey Point's unprecedented license extension with an inadequate generic environmental review that had been prepared in 1996 and revised in 2013. This review only looked at environmental impacts of operating a reactor from 40 years through 60 years. That means the analysis didn't consider the further aging of the reactors or how increased climate impacts like sea level rise or increased storm strength could affect specific reactors. Given the way rising seas and stronger storms are affecting southern Florida, getting this analysis right is crucially important.

The Department of Energy just called for operators of reactors to apply to the new civil nuclear credit program—a program established by the 2021 Infrastructure Act designed to keep aging and uneconomic nuclear power plants online in recognition of their low carbon energy. With the support of this and similar state programs, many of the operators of the 93 reactors online today in the US will no doubt seek to extend their operating licenses to 80 years.

NRDC partnered with Friends of the Earth and Miami Waterkeeper to argue against this inappropriate reliance on a generic, fundamentally weak scientific and technical analysis. And while the case of the Turkey Point Plant was so important because of the intense climate risks, it was also an important precedent to ensure a thorough safety and environmental review for all aging reactors across the country.

The NRC Staff and FPL had argued that the further extension of the license based on the out-of-date environmental analysis did not offend the National Environmental Policy Act, but the NRC's order on Feb. 24 rejected that view. The Commission has now committed to evaluating the unique risks of further extending the operation of nuclear reactors.

The timing of this decision could not be better. The Department of Energy just called for operators of reactors to apply to the new civil nuclear credit program—a program established by the 2021 Infrastructure Act designed to keep aging and uneconomic nuclear power plants online in recognition of their low carbon energy. With the support of this and similar state programs, many of the operators of the 93 reactors online today in the US will no doubt seek to extend their operating licenses to 80 years.

Supporting and expanding nuclear power should not be the leading strategy for diversifying America's energy portfolio and reducing carbon pollution—unless and until the major environmental and safety risks associated with the nuclear fuel chain are properly mitigated. Meanwhile, the changing climate will affect the safety and environmental risks of continuing to run these plants. There are still many unknowns about the safety of running the reactors out so many years and in a world with growing stresses from climate change. We cannot take chances with nuclear power, and a complete environmental review will help to shed light on how these aging plants are operating and the risks they will face.

If nuclear power plants are going to keep operating, it is vital that they operate right.With its recent order, the NRC acknowledged that it had failed to do the necessary environmental review

and has set itself on a course to fix this mistake. The agency took a single vital step in ensuring that the environmental and safety risks of the aging nuclear fleet are taken into account before approving license extensions. The Commission decision will hold aging reactors to a necessary higher standard of review for safety and environmental impacts. With this decision, the NRC has restored the level of accountability we sought through our lawsuit. Now comes the next important step: We will be working hard to ensure these environmental reviews thoroughly examine the safety risks and impacts of climate change.

Source: https://www.nrdc.org/experts/caroline-reiser/win-proper-nuclear-safety, 25 February 2022.

NUCLEAR WASTE MANAGEMENT

UK

UK Startup Puts AI at the Center of Radioactive Waste Management

Despite stringent regulations, Radioactive Waste Management (radwaste disposal) remains one of the most hazardous activities in the modern atomic energy industries. Radwaste management not only endangers the life of workers at the nuclear sites but also poses a grave biological and physical danger to life forms and resources in the vicinity of a nuclear plant or storage facility. Currently, over a quarter-million tonnes of radioactive waste has piled upon the earth's surface due to rampant weaponization and nuclear energy operations around the world. Cost-wise, it takes approximately $300,000 USD to manage a radwaste facility in an operational nuclear plant, and more than $8 million for a closed facility. According to a study, it is much costlier to reprocess spent fuel (~$600 USD per kilogram) as compared to direct disposal. A UK-based AI firm has come up with a solid solution to manage radwaste disposal and storage.

UK AI firm, Faculty, has partnered with Veolia Nuclear Solutions to build a radioactive waste-sorting solution as part of Innovate UK's 7.5 Million USD [£5.5 million] Sort & Seg competition. Using AI and machine learning applications, radioactive waste management is set to be sorted quickly and managed more safely through a research and development program between government and industry.

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Faculty is one of Europe's leading applied artificial intelligence companies that builds, deploys, and operates AI solutions to increase customers' performance and help them realize their full potential in diverse business operations. It is currently working with more than 230 organizations across the public and private sectors, enabling them to use AI ethically by helping these users understand more deeply, make better decisions and act faster. By bringing AI to the center of radioactive waste management, Faculty AI could completely eliminate the risks commonly associated with the handling of fission elements and decayed elements, post-atomic energy cycle.

Funded by the Nuclear Decommissioning Authority (NDA), the Innovate UK 'Sort & Seg'' competition seeks safer, faster, and cheaper ways of handling nuclear-decommissioning waste, which can pose a risk to humans and the environment if not managed correctly. The competition has tasked participants with creating an automated solution capable of identifying, classifying, and sorting intermediate and low-level waste with minimal human input.

Veolia Nuclear Solutions, in partnership with AI firm Faculty, as well as Createc, Mott MacDonald, and the University of Lincoln, are solving the logistical and economic challenges of sorting and segregating low and intermediate radioactive waste generated from decommissioning activities. The consortium is one of five that has progressed through to the second phase of the competition.

Faculty brings machine learning and AI expertise to provide directions to the project's robotic arm and gripper, which will identify, sort, and categorize waste with minimal human input. Whilst the amount of radioactive waste in the UK is relatively small, the Nuclear Decommissioning Authority has previously estimated around 5 million tonnes

could be produced over the next century – enough to fill Wembley stadium. Much of this is set to come from dismantling existing legacy nuclear facilities, such as Sizewell A and Wylfa, and by cleaning up other existing sites. Currently, some waste still requires manual sorting by staff wearing PPE. The competition aims to accurately sort bulk, lower-level radioactive waste requiring disposal, whilst increasing overall recycling rates.

The winning solution will also improve worker safety, increase productivity, reduce costs, and minimize risks to the environment through increasing recycling rather than disposal. Demonstrations to NDA and Innovate UK will take place in November 2022. Successful models could then progress to trials and subsequent use at decommissioning sites, with the potential to be exported internationally. The system could also be adapted in other future waste disposal and object sorting systems, beyond the radioactive waste sector. Veolia Nuclear Solutions in the UK is a world-leading provider of remote handling and waste management solutions for extremely hostile environments, with proven technology and a track record of providing innovative solutions in key sectors including nuclear fusion, nuclear decommissioning, health and high-energy physics. As part of the Veolia Group, this offers access to a network of experts and technologies.

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Source: https://aithority.com/ait-featured-posts/uk-startup-puts-ai-at-the-center-of-radioactive-waste-management/, 22 February 2022.

Centre for Air Power Studies

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal Anil Chopra, PVSM AVSM VM VSM (Retd).

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