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**JOINT STATEMENT**

**Joint Statement of the Leaders of the Five Nuclear-Weapon States on Preventing Nuclear War and Avoiding Arms Races**

China, France, Russia, UK, and USA consider the avoidance of war between Nuclear-Weapon States and the reduction of strategic risks as our foremost responsibilities. We affirm that a nuclear war cannot be won and must never be fought. As nuclear use would have far-reaching consequences, we also affirm that nuclear weapons...should serve defensive purposes, deter aggression, and prevent war. We believe strongly that the further spread of such weapons must be prevented.

We reaffirm the importance of addressing nuclear threats and emphasize the importance of preserving and complying with our bilateral and multilateral non-proliferation, disarmament, and arms control agreements and commitments. We remain committed to our NPT obligations, including our article VI obligation "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear

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disarmament, and on a treaty on general and complete disarmament under strict and effective international control." We each intend to maintain and further strengthen our national measures to prevent unauthorized or unintended use of nuclear weapons. We reiterate the validity of our previous statements on de-targeting, reaffirming that none of our

We underline our desire to work with all states to create a security environment more conducive to progress on disarmament with the ultimate goal of a world without nuclear weapons with undiminished security for all. We intend to continue seeking bilateral and multilateral diplomatic approaches to avoid military confrontations, strengthen stability and predictability, increase mutual understanding and confidence, and prevent an arms race that would benefit none and endanger all. We are resolved to pursue constructive dialogue with mutual respect and acknowledgment of each other's security interests and concerns.

Source: <https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/03/p5-statement-on-preventing-nuclear-war-and-avoiding-arms-races/>, 03 January 2022.

**OPINION – Manpreet Sethi**

**Disparity, Escalation Key Issues for NPT Review**

The NPT Review Conference (RevCon) that was scheduled for the first week of January 2022 could not take place owing to the rising cases of Covid. The gloom over the postponement, the third since the original date of the RevCon in May 2020, was however, somewhat dispelled on January 3, 2022, when the five nuclear weapon states, the P-5, announced a joint statement that echoed the words of Presidents Reagan and Gorbachev from November 1985, that “a nuclear war cannot be won and must never be fought”.

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Having worked on reconciling their differences to get the statement ready, the P-5 found it expedient to release it, possibly, for two reasons — one, to bind each other to the commitments enlisted in the statement; and secondly, to collectively ward off pressure from NNWS, which is anticipated during the first meeting of the state's party to the Treaty on Prohibition of nuclear weapons, to be held later this month.

Whatever be the motivation, this is the first occasion when the five have jointly made an attempt to address the issue of growing strategic risks. In recent times, such a sentiment has only been expressed at the bilateral level — between Presidents Biden and Putin; and between Presidents Putin and Xi. A joint affirmation of the thought that “nuclear weapons — for as long as they continue to exist — should serve defensive purposes, deter aggression, and prevent war” has been expressed for the first time.

The response to the joint statement has been varied. Several, including the UN Secretary General, have welcomed it as useful move that reinforces their commitment to eventual elimination of nuclear weapons. But many NNWS and nuclear disarmament activists, such as ICAN, have cynically dismissed such verbal assurances as meaningless in view of the ongoing modernisation of arsenals.

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The true value of the statement, of course, will only emerge when actions follow the expression of lofty words. The P-5 have committed to “continue seeking bilateral and multilateral diplomatic approaches to avoid military confrontations, strengthen stability and predictability, increase mutual understanding and confidence, and prevent an arms race... to pursue constructive dialogue with mutual respect and acknowledgment of each

other's security interests and concerns." All of these resolutions, however, will not be easy given the differences in their approach to nuclear weapons, deterrence doctrines and threat perceptions.

It is fortunate that the statement has been made ahead of the scheduled NPT RevCon, now planned for August 2022. This gives precious eight months to the five governments to show some concrete action to realise the vision of the statement. It will also give the NNWS an opportunity to evaluate the movement in this direction as per the benchmarks laid down in their statement and comment on it at the RevCon, thereby not letting the P-5 forget or ignore their pledges.

Thirty-seven years ago, when Presidents Reagan and Gorbachev had first made such an articulation, it had led to transformational developments. They too had met in rather tense times over "serious differences". They too had acknowledged and emphasised the importance of "preventing any war between them, whether nuclear or conventional", and also pledged that they would "not seek to achieve military superiority". Subsequently, both took unilateral, reciprocal or joint measures to make this possible. An ongoing dialogue process and more summit meetings in quick succession paved the way for landmark treaties-START and INF.

India has welcomed the P-5 statement. In fact, New Delhi could go a step further and echo the same at an individual level. It could also call upon the P-5 to start realising their promises by joining India on the two resolutions that it annually presents at the UNGA. One of this precisely matches the P-5 promise to address nuclear dangers. India's resolution is called "Reducing Nuclear Dangers" and calls for steps to reduce the risk of unintentional or accidental use of nuclear weapons, including through de-alerting and de-targeting of nuclear weapons. A second resolution on Convention on Prohibition of Nuclear Weapons would perfectly fulfil the expressed desire of the

statement to create a security environment conducive to progress on disarmament since it seeks an international convention prohibiting the use or threat of use of nuclear weapons.

Support to the statement by India, including by voicing the main point on futility of nuclear war, would not only earn it goodwill, but also be useful at four other levels: one, it would pitch India alongside the P-5; second, it would distinguish India from the other non-NPT countries with nuclear weapons; third, if P-5 take steps to reduce the salience of nuclear weapons, it would support

India's contention that this is the only credible and sustainable way to get to nuclear disarmament; fourth, a resultant lowering of international tensions between nuclear weapon possessors would be in India's security interest.

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Indian support for the statement and a decision to offer similar commitment will not really demand any immediate steps that could adversely impact its nuclear deterrence. India's nuclear doctrine already accepts the ideas of minimum deterrence and no first use. Other NWS, in fact, will have to match these as a way of implementing their joint statement. India, therefore, can help make the P-5 statement a big deal for international security.

*Source: <https://www.tribuneindia.com/news/comment/disparity-escalation-key-issues-for-npt-review-360082>, 11 January 2022.*

**OPINION – Shyam Saran**

**P5 Statement on Nuclear Disarmament is Solemn but Not Credible. Previous Treaties are Proof**

On 3 January, the five permanent members, the P5, of the United Nations Security Council — China, France, Russia, the United Kingdom, and the United States — issued a joint statement of their leaders declaring their commitment to 'preventing nuclear war and avoiding arms races'. The statement is noteworthy as it is issued on behalf of the leaders of the P5, who are also the original five nuclear-

weapon States. It has greater solemnity if not credibility. It was clearly aimed at the Tenth Review Conference of the Treaty on Non-Proliferation of Nuclear Weapons, or the NPT, scheduled to be convened from January 4, but was postponed due to the Covid-19 surge.

The non-nuclear-weapon States party to the NPT are dissatisfied at the lack of progress in achieving nuclear disarmament, to which the nuclear-weapon States had committed themselves in Article VI of the treaty. With the statement, the P5 would have hoped to deflect the negative sentiment against them. The P5 sought to convey that despite the political tensions prevailing in their relations, they were adopting measures to reduce the risk of the use of nuclear weapons and would continue to work together to prevent a nuclear arms race. They acknowledged that 'a nuclear war cannot be won and must never be fought'. This echoes a dictum that emerged from the Reagan-Gorbachev summit of 1985 when the leaders declared that 'a nuclear war cannot be won and must never be fought'.

**Arms Control Agreements:**

If this is what the P5 truly believes, it is difficult to understand their rejection (except China) of the principle of the non-use of nuclear weapons, which has been on the UN agenda for several decades. The P5 has been consistent in their rejection, even condemnation, of the TPNW, which was adopted by a large majority of the members of the UN (122) on 7 July 2017, and came into force on 22 January 2021. The TPNW prohibits the development, testing, production, acquisition, possession, stockpiling, and use or the threat of use of nuclear weapons that would have been the logical outcome of the P5 delivering on their

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commitment to achieve nuclear disarmament. India has also rejected the treaty.

The P5 statement emphasises 'the importance of preserving and complying with our bilateral and multilateral non-proliferation, disarmament, and arms control agreements and commitments'. The reality is that over the past decade, we have seen a whole series of arms control agreements being abandoned. The US withdrew from the ABM treaty in 2002, the INF treaty in 2019 and the Open Skies agreements in 2020. The only bilateral US-Russia arms control agreement still in force is the Strategic Arms Limitation Treaty, which was extended in 2021 and will expire in 2026. The CTBT has not yet been ratified and no new arms control agreements are in the offing. Therefore, the statement is not credible.

An important commitment on behalf of the P5 is the reaffirmation that 'none of our nuclear weapons are targeted at each other or any other State'. But with current technology, targeting can be done almost instantly. What is more important is keeping weapons de-mated from delivery vehicles. The deployment of hypersonic glide weapons greatly enhances the risk of pre-emptive strikes, both nuclear and non-nuclear weapons. In the light of this record, it is difficult to feel reassured

by the P5 statement.

**Previous Statements by P5:** A Chinese official suggested that this statement was the first of its kind from the P5. That is not true. The P5 has issued statements on nuclear issues in the past at the official level. There was a similar statement at the foreign ministers' level on the 50th anniversary of the NPT on 10 March 2020. A

P5 process has been in place at Geneva since 2008, associated with the Conference on Disarmament (COD), but its proceedings are in the nature of informal consultations. The P5 may have major differences among them but usually collude when their common interests are under threat, such as their privileged status as permanent members of the UNSC or as the only states that are 'legitimate', because only they are acknowledged as nuclear-weapon States under the NPT.

It should be apparent that the assurances contained in the statement do not have credibility because they have excluded the four other states that have nuclear weapons but are not acknowledged as such under the NPT. These are India, Israel, Pakistan, and North Korea. Their nuclear arsenals may be small, but capable of triggering a catastrophic war. Any credible set of assurances must include their commitments. Their inclusion in any nuclear non-proliferation or nuclear disarmament process will not be possible under the NPT, since they are not members. Even if the P5 were able to reach some significant nuclear arms control or disarmament agreements among themselves, these would be incomplete without the participation of the four non-NPT nuclear-weapon states. It makes more sense to initiate a multilateral negotiating process at COD at Geneva, which is the sole multilateral body under the UN-mandated to negotiate arms control and agreements. Issues of nuclear war cannot only be the business of those who possess such weapons.

### **Discourse on Nuclear Weapons:**

Much of the discourse on nuclear weapons and doctrines have evolved in the East-West binary, dominated by the two erstwhile superpowers — the US and the then Soviet Union during the Cold War. The world is

different today. Not only are there several more nuclear actors but their doctrines of use of nuclear weapons are also different. The dynamics among nine nuclear-weapon States will be different from the old binary context. The US and Russia are today unable to reach significant nuclear weapons agreements because each is concerned about the rise of China and the rapid build-up of its nuclear and delivery assets. But China is not ready to enter into trilateral negotiations. India

has to worry about both Pakistan and China. It is only in a multilateral negotiating process that these asymmetrical realities can be addressed, and hopefully, reconciled. India has been a constant champion of this at COD and should continue to mobilise a larger constituency in its support.

*Source: <https://theprint.in/opinion/p5-statement-on-nuclear-disarmament-is-solemn-but-not-credible-previous-treaties-are-proof/801388/>, 12 January 2022.*

### **OPINION – Heather Williams**

#### **Concrete Measures Matter More Than Words for the P5**

Sometimes, short sentences carry a lot of weight. "A nuclear war cannot be won and must never be fought." This phrase was used repeatedly by Presidents Reagan and Gorbachev in the final days of the Cold War, earning it the moniker "Reagan-Gorbachev statement," but it was only recently used for the first time by the P5 in a joint statement released on January 3, 2022. While the Reagan-Gorbachev language has received significant attention, it is but one sentence in a much longer statement. The most interesting and impactful aspect of the P5's work, namely strategic risk reduction, has been largely overlooked.

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**The most interesting and impactful aspect of the P5's work, namely strategic risk reduction, has been largely overlooked. Ultimately, the Reagan-Gorbachev statement is unlikely to have any significant impact, but strategic risk reduction efforts could lead to the development of concrete measures to manage geopolitical crises and tensions.**

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**Guardrails Over Gestures:** Reagan first used the phrase “a nuclear war cannot be won and must never fought” in a radio address on Apr. 17, 1982, but the phrase came to prominence following the 1985 Geneva summit. The summit did not yield any breakthroughs in arms control but did result in a joint statement by Reagan and Gorbachev agreeing to further dialogue. The Soviet and American leaders again used the phrase at the signing of the INF Treaty in 1987. At the time it was seen as an important symbolic gesture toward détente and cooperation on arms control. Most recently it was repeated by Presidents Biden and Putin following the June 2021 summit in a joint statement on strategic stability.

In recent years, there has been pressure for other countries to sign up to the Reagan-Gorbachev statement, particularly within the “P5 process,” because it could signal shared awareness of rising nuclear risks and pave the way for progress on arms control or contribute to the NPT. The “P5 process” was established in 2009 to provide a forum for the five NPT recognized nuclear possessors to discuss their shared responsibilities under the treaty and facilitate progress toward disarmament. The group meets annually with a rotating host, and the recent statement was released in anticipation of the NPT Review Conference, which typically occurs every five years, but has been repeatedly postponed.

While the recent P5 statement is a welcome development, it will not have the desired impact for at least three reasons. First, while the statement might have been a symbol of

détente in tandem with arms control during the Cold War, today’s geopolitical landscape is very different given the build-up of both Russian troops on the Ukrainian border and the increase in China’s arsenal, and ongoing peer competition. Second, as a stand-alone, it will not reconcile differences over arms control, such as American concerns about Russia’s history of non-compliance, or induce China to join arms control agreements. Finally, the P5’s use of the Reagan-Gorbachev statement will not improve prospects for a positive outcome at the NPT Review Conference. Critics of the P5 have already dismissed the statement and accused them of hypocrisy.

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The Reagan-Gorbachev language, however, is just one sentence in a longer, and more interesting, P5 statement. In the statement’s opening sentence, the P5 recognize, “the reduction of strategic risks as our foremost responsibilities.” And the recent P5 statement itself is just one piece of a broader effort to reduce nuclear risks, which includes a December 2021 communique and a four-page working paper on strategic risk reduction. The December communique, for example, launched a pilot project to develop a Young Professional Network or P5 academics. The P5 statement and work on risk reduction should be seen as an important opportunity to develop new nuclear guardrails.

**Next Steps for Progress on Risk Reduction:** Now that the Review Conference has been postponed, the P5 should focus on four specific steps to make progress on strategic risk reduction. First, the P5 should develop a catalog of existing risk reduction mechanisms in partnership with nongovernmental organizations and academia, which have conducted extensive research on these initiatives. Recent research on the evolution and application of hotlines, for example, could contribute to the

P5's thinking on how to expand existing risk reduction tools or develop new ones.

Second, the P5 should focus on threats from emerging technologies that could exacerbate misperceptions during a crisis. One option would be to develop a 21st-century version of the Incidents at Sea Agreement, such as the Incidents in Space Agreement, to establish rules of the road and procedures for avoiding misperceptions, such as an entanglement scenario.

Third, the P5 should focus on ways to expand existing crisis communication channels.

China is the only member of the P5 outside of the Nuclear Risk Reduction Centers network, so the P5 process can provide a forum for discussing the benefits of the network and how China might join. While there is a Moscow-Beijing hotline, China is otherwise largely removed from crisis communication networks, despite efforts by the United States and others. Given China's leadership within the P5 process, cooperation on risk reduction might provide a timely opportunity to increase channels for dialogue.

Finally, the P5 should collaborate with other important initiatives on risk reduction, particularly the Stockholm Initiative, which released a working paper on risk reduction in spring 2021 calling for the P5 to, among other things, reduce "the risk of miscalculation or misperception and accidental use of nuclear weapons, including through the establishment and enhancement of hotlines building on robust and trusted crisis communication technology, joint data centers, military-to-military dialogue, and other cooperative measures."

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**The P5, therefore, should clarify if and how they see risk reduction as contributing towards their NPT disarmament obligations. Finally, and perhaps most importantly, the P5 process, like everything in the NPT, is at the mercy of geopolitics.**

**The Challenges:** The P5 will face numerous challenges in pursuing this work on risk reduction. Indeed, risk reduction is one of five other agenda items for the P5, so managing the group's capacity and prioritizing a limited number of initiatives will be important. Additionally, critics of the P5 will claim strategic risk reduction is just an excuse for lack of progress towards disarmament. The P5, therefore, should clarify if and how they see risk reduction as contributing towards their NPT disarmament obligations. Finally, and perhaps most importantly, the P5 process, like everything in the NPT, is at the mercy of geopolitics. It is impressive the P5 could

agree to three important documents in the lead-up to the NPT Review Conference given rising geopolitical tensions. That cooperation should not be taken for granted and may prove to be short-lived, which makes the need for concrete risk reduction measures all the more urgent.

*Source: <https://inkstickmedia.com/concrete-measures-matter-more-than-words-for-the-p5/>, 10 January 2022.*

**OPINION – Michael Krepon**

**Arms Control Between Nuclear-Armed Rivals**

...We barely survived one nuclear-armed rivalry during the Cold War. Now there are four, each presenting multiple pathways leading to tight corners. There will be five if or when Iran's new leadership possesses highly enriched fissile material and the wherewithal to make nuclear warheads. Another outlier, North Korea, repeatedly calls attention to its nuclear weapons and their means of delivery.

The global nuclear "order" accommodates incremental adjustments. Four states in Asia are increasing their warhead totals, none more

purposefully than China. Sterner challenges could lie ahead. The greatest threat to nuclear order arises when major powers are dissatisfied with the status quo. The two primary threats to nuclear order are therefore posed by China and Russia. Can nuclear-armed rivals do arms control? Absolutely. U.S.-Soviet experience during the Cold War proved that. But only if rivals do not seek to change the status quo in sensitive locales by force of arms.

At the end of the Cold War, dangerous military practices had virtually ended, marked by agreements between Moscow and Washington to avoid incidents at sea and provocative actions by ground forces and air forces operating in close proximity. These guidelines suited Moscow when the Kremlin was satisfied with the status quo, but no more. Moscow threatens to make further inroads on Ukraine's territorial integrity and national sovereignty while Beijing is flexing its power across the Taiwan Strait and in the South China Sea. To complicate matters further, dangerous military practices have become a hallmark of all four nuclear rivalries. Clashes over disputed borders between China and India and between India and Pakistan begin where the last ones have left off. Upping the ante seems to be the new norm. Previous concerns over disorder prompted by nuclear terrorism, much hyped post-9/11, now seems quite modest compared to contemporary challenges.

At times like these, it's worth remembering that pundits widely presumed nuclear war to be inevitable after 1945. Predictions of nuclear use didn't subside until the second Reagan administration and made a comeback after

Donald Trump's election. More recently, some savants have predicted space warfare to be inevitable. Ditto for cyber warfare that produces massive damage. All of this remains possible, but worst-case predictions do not have a good track record. Warfare isn't inevitable as long as the human factor weighs heavily on national leaders operating with little sleep-in deep crisis. The human factor, at least in the business of arms control, can be defined as determination to avoid Armageddon.

The nuclear revolution predicted by the late, great Robert Jervis and others has been only partially realized and acknowledged. So far, deterrence has helped prevent worst cases. Even in extremis, national leaders have chosen not to cross the nuclear threshold. But the twin impulses that drive deterrence — seeking advantage and seeking to avoid disadvantage — remain with us. The nuclear revolution hasn't stopped geopolitical competition.

Jervis never claimed this. As before, the twin impulses driving nuclear deterrence continue to add increments to offensive capabilities. Since one increment leads to the next, rivals do not feel more secure as a result. Washington and Moscow — the only rival pair now operating under bilateral treaty constraints — have settled on numbers, but both still seek incremental gains and seek to avoid incremental losses.

Deterrence has always been and continues to be a far weaker reed than its backers acknowledge. Deterrence fails repeatedly in lesser cases, and failures in lesser cases have built-in escalatory dynamics. Adding increments of deterrence does not make flash points more amenable to resolution. For this, diplomacy is needed, but diplomacy is in short supply for every nuclear rivalry. Diplomacy faces long odds against states intent on changing

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the status quo by force of arms. If a state is hell bent on risk taking, diplomacy will fail. Diplomacy can only succeed if leaders acknowledge that changing the status quo by the use of force entails great risks and that risk taking could result in failure far beyond expected gain.

The diplomacy of arms control found the space to succeed when, after intense crises over Berlin and Cuba, superpower rivals tacitly agreed not to play with fire in sensitive locales and not to change the status quo by force of arms. Small successes led to astounding successes as the Cold War came to a close. This success story not only avoided mushroom clouds, but also established conditions for nuclear peace when the Cold War ended — a wildly improbable result. Deterrence was the backdrop to this success; arms control provided the instrumentalities for its realization. Alas, this is not the end of the story. After the Cold War ended, Presidents Bush, Putin, and Trump deemed many of the key elements of nuclear peace to be dated, unnecessary, and inconvenient.

The tasks now before us, like the challenges that previous generations tackled, are to rebuild guardrails against the use of nuclear weapons and to reduce nuclear dangers. We can find our footing by refreshing some of the techniques of arms control — but only if rivals avoid direct challenges to each other's core interests and are willing to reduce nuclear dangers through practical, observable measures. If leaders seek to avoid war, added increments of diplomacy, unlike added increments of nuclear deterrence, can move rivals away from the nuclear precipice. Diplomacy remains far more cost effective than spending large sums for nuclear deterrence, but diplomacy is habitually short changed. In three of the four nuclear rivalries, it barely has a pulse. Treaties are the most notable and hardest-to-achieve instruments of diplomacy designed to reduce nuclear dangers. Some treaties, bilateral and multilateral, remain in effect, but new U.S.-Russia

treaties are presently beyond reach. New treaty making related to the other three rival pairs is an even more distant prospect.

Where does this leave us? Protection against catastrophe cannot safely rest on deterrence alone. The words “safety” and “plans for the employment of nuclear weapons” do not belong in the same sentence. Nor can safety rest solely on treaties, declaratory policies, and defense budget allocations. The primary mechanisms for controlling and reducing nuclear dangers in current circumstances are low profile, but crucial diplomatic instruments – instruments that have a track record of success in preventing mushroom clouds, whether as supplements to treaties, or despite their absence. I'm referring, of course, to norms and to a wide panoply of confidence, security-building, and nuclear risk-reduction measures. These practical remedies are well known; they are generically applicable to all four pairs of nuclear-armed rivals. Nuclear-armed rivals that wish to avoid mushroom clouds can find common cause in reducing nuclear danger. But not when leaders believe that extreme risk taking is either unavoidable or can succeed.

*Source: <https://www.armscontrolwonk.com/archive/1214389/arms-control-between-nuclear-armed-rivals/>, 10 January 2022.*

**OPINION – Andrew Futter, Francesca Silvestri**

**A New Nuclear Age in South Asia?**

There is a feeling amongst academics, professionals, and some policymakers that the global nuclear order is in a period of flux and perhaps transformation. This shift is being driven by the development and deployment of a range of different military technologies with possible strategic effects and by a concurrent shift in the context and environment within which nuclear weapons issues are thought about and nuclear peace is maintained. However, with a few notable exceptions, this discussion has focused primarily

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on the US–Russia and US–China relationship.

The strategic balance between these three major nuclear powers is undoubtedly important, but far less attention has been given to the impact—both directly and indirectly—of these developments in South Asia. While the potentially transformative impact of disruptive, often non-nuclear weapons technologies and associated systems may be at an early stage in South Asia, we can already see how such developments could lead to new types of nuclear risks, the undermining of stability, and perhaps an increased chance of nuclear use.

The global challenge appears on the surface to be principally technological: The development and deployment of increasingly sophisticated missile defences; the emergence of non-nuclear long-range precision strike capabilities (including hypersonic weapons), as well as renewed interest in exotic means of nuclear delivery; new and more conspicuous methods of counter-space, anti-submarine, and cyber warfare, all of which are unfolding in a real-time and porous nuclear information space. These challenges are playing out at the same time as a return to great power competition between the US, Russia, India, and China in a more competitive geopolitical landscape. This combination creates new problems across the global nuclear order, but perhaps is nowhere more acute than in Southern Asia. Indeed, these developments could alter regional nuclear deterrence dynamics, trigger an already simmering arms race between India and Pakistan, and increase the risk of unintended escalation.

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Both India and Pakistan have demonstrated a growing appetite for new types of strategic weaponry, and while not always in public, they

are clearly beginning to factor in the possible impact of new types of capabilities by each other for deterrence and security. One author has already warned of a possible move towards an “Indian counterforce” doctrine, possibly involving strategic non-nuclear as well as, or even instead of, nuclear weapons, and the possible impact of a multi-layered Indian BMD—and its link with new Pakistani

nuclear delivery systems—has been part of this debate for over a decade. The worry, of course, is that the introduction of more sophisticated and destructive technologies in South Asia is going to lock India and Pakistan in a security dilemma and create a vicious cycle that will become increasingly difficult to break.

The existing academic literature on technological change in military capabilities, and especially the advent of strategic NNW and South Asia tends to focus on the capabilities of these technologies and to emphasise the risks inherent in their use, but limited attention is paid to the political discourse and perceptions on how India and Pakistan intend to use these technologies in the future, and how this is going to affect their doctrines.

For sure, South Asia is currently lagging behind the US, China, and Russia in the

development of SNNW capabilities and doctrine, and the role that these technologies will play in the region will largely depend on the geostrategic and political interests and the evolution of the strategic dynamics. That said, the impact of these technologies in South Asia could be more acute given the past history of confrontation, unsettled

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strategic balance, incendiary political flashpoints, and the short decision-making times resulting from geography and a contiguous border.

To understand the impact that SNNW, in particular, will have on South Asia, we need to look at the broader picture. The increasing interdependence between the international and regional levels has contributed to creating a domino effect, linking the United States, China, India, and Pakistan. These dynamics will not only shape security relations between the great powers, but will also

have dangerous spillover effects in South Asia and in other regions too. In the last few years, the US' nuclear and military modernisation and growing reliance on non-nuclear technologies with strategic impact have pushed China to develop more sophisticated technologies of their own.

Growing concerns about China's intentions and capabilities —especially the fear of a rapid increase in nuclear warheads and delivery vehicles—have triggered a cascade effect whereby India will respond by expanding its nuclear programme and seeking to develop SNNW, while Pakistan will follow to catch up with India.

The intensification of the competition between the United States and China, together with the efforts of Washington and Beijing to establish stronger ties with India and Pakistan respectively, are also transforming South Asia's strategic landscape. In the last few years, the US–India civil nuclear deal

culminated in the establishment of a strategic partnership, exacerbated a marked deterioration of US–Pakistani relations, and has led to the strengthening of China-Pakistan cooperation

through the CPEC and BRI. At first glance, it may appear to have created two distinct blocs (US-India vs China-Pakistan), but the reality is more nuanced and complex.

At the moment, relations between the US and Pakistan are at a low point, but the Biden administration wants to continue to cooperate with Pakistan because of its support for US counterterrorism initiatives, to monitor its nuclear capabilities, and to keep the lines of communication open to the Pakistani military.

Pakistan, in turn, wants to keep a stable relationship with both the US and China. This is because Pakistan has a long history of cooperation with the US that dates back to the Cold War, and it has been one of the main recipients of US foreign aid, while China remains a crucial economic

and military partner. Finally, India shares US concerns about China and how to manage its rise in the Indo-Pacific region, but the Indian government does not want to be embroiled in a formal alliance with the US because it wants to

preserve its strategic autonomy and does not want to be caught in a conflict that could hamper its economic growth.

Whether it is right to conceive of South Asia as entering into a "Third Nuclear Age"; whether it is in the same way as other nuclear-armed actors is a matter of debate: Each region and each state may experience this shift in global nuclear order differently. Nuclear

developments in and by India and Pakistan have never quite fitted with the predominantly western notion of splitting nuclear history into distinct "ages" either side of the end of the Cold War. But

**Growing concerns about China's intentions and capabilities —especially the fear of a rapid increase in nuclear warheads and delivery vehicles—have triggered a cascade effect whereby India will respond by expanding its nuclear programme and seeking to develop SNNW, while Pakistan will follow to catch up with India.**

**Nuclear developments in and by India and Pakistan have never quite fitted with the predominantly western notion of splitting nuclear history into distinct "ages" either side of the end of the Cold War. But irrespective of the terminology, Third Nuclear Age dynamics: Disruptive, often non-nuclear-technologies with strategic effect, geopolitical competition, and a complex and fluid nuclear information environment, will impact the future of the region, and particularly the nature and shape of nuclear risks.**

irrespective of the terminology, Third Nuclear Age dynamics: Disruptive, often non-nuclear-technologies with strategic effect, geopolitical competition, and a complex and fluid nuclear information environment, will impact the future of the region, and particularly the nature and shape of nuclear risks. There is still time to, in effect, get ahead of these developments and perhaps even mitigate some of the worst possible implications before they fully materialise in the region, but this will require a genuine interest in dialogue, risk reduction, and restraint that has been conspicuously absent in recent times.

Source: <https://www.orfonline.org/expert-speak/a-new-nuclear-age-in-south-asia/>, 07 January 2022.

**OPINION – Caroline Glick**

**How to Avert a Nuclear Crisis With Iran?**

There are growing indications that the Biden administration is slowly recognizing its Iran policy has failed. Unfortunately, President Joe Biden and his team have no idea what to do now. This is the message of a recent article by Robin Wright in *The New Yorker*. Titled “The Looming Threat of a Nuclear Crisis with Iran,”

Wright’s 5,000-word treatise covers an interview with Iran negotiations envoy Robert Malley, CENTCOM Commander Gen. Kenneth McKenzie, nuclear proliferation experts, Iranian officials and others. And what they all said, effectively, is that they don’t know what to do.

The nuclear negotiations in Vienna are going

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**Iran’s nuclear weapons program is not even the most acute threat Iran poses to the U.S. and its allies. Iran’s missile arsenal, which is the largest and the most diverse in the region, can overwhelm most missile defense systems. Its ballistic missiles are precise, powerful and capable of reaching targets as far away as India and southern Europe, not to mention all countries in the Middle East.**

nowhere, as Iran marches across the nuclear threshold. And on the off-chance Iran agrees to make some sort of deal with the administration, the deal will give Iran a lot of money, but it won’t significantly stop its path to a nuclear arsenal. So, the entire exercise is futile... Iran’s nuclear weapons program is not even the most acute threat Iran poses to the U.S. and its allies. Iran’s missile arsenal, which is the largest and the most diverse in the region, can overwhelm most missile defense systems. Its

ballistic missiles are precise, powerful and capable of reaching targets as far away as India and southern Europe, not to mention all countries in the Middle East. Iran’s proxies in Lebanon, Syria, Gaza and Yemen are fully integrated into Iran’s war machine. They are well-armed and they operate at Iran’s command... Iran’s nuclear sites are so well fortified, and its missile arsenal and proxy forces are so formidable, that were the U.S.

to find itself in a war with Iran, it would take at least a year and massive losses— “We would be hurt badly”— before the U.S. would prevail.

So, a nuclear deal is out, at least as a non-proliferation tool. War is a terrible option and...the option of sanctions has “exhausted” itself. The stakes for the U.S. are exceedingly high. While a hegemonic, nuclear-

armed Iran is an existential danger to Israel, it also poses a massive threat to the U.S. The Iranian regime makes no effort to hide the fact that it hates and wishes to destroy the U.S., which it refers to as the “Great Satan” (Israel is the regime’s “Little Satan”). A nuclear-armed Iran would pose a mortal threat to all U.S.

military forces in the Middle East and Africa. And Iranian terror forces in Latin America pose threats to the U.S. mainland.

A nuclear-armed Iran would end all gains the U.S. has made over the past 75 years in preventing nuclear proliferation and arms races. Not only would Russia and China massively increase their nuclear arsenals. Saudi Arabia, Egypt, Turkey and other regional states would follow Iran in developing or purchasing nuclear arsenals of their own. And, following hot on the heels of America's humiliating retreat from Afghanistan, a nuclear-armed Iran would destroy the vestiges of U.S. superpower credibility in the region and the world. Given the danger a nuclear-armed Iran represents for U.S. national security and America's global position and interests, it behooves the administration to consider new policy options now that its nuclear diplomacy has failed. Two, in particular, deserve serious consideration. One has the advantage of a track record of success, and the other has no track record because no one has ever tried it.

Option one is sabotage of Iran's nuclear sites. A frequent comment from Americans tired of the Middle East is that since they have been reading the same doomsday predictions about Iran's imminent acquisition of nuclear weapons for nearly 20 years, the danger must be fabricated. These commentators fail to recognize that there is a reason Iran hasn't become a nuclear power yet despite the doomsday predictions. All the mysterious explosions in centrifuge assembly lines, enrichment sites and research facilities, and all the nuclear scientists killed in car

accidents, were not coincidental. They were part of a deliberate strategy led by Israel to slow Iran's nuclear advances. And that strategy has been successful.

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Biden and his team ought to reconsider their opposition to Israel's independent actions. This brings us to the second option, which no U.S. administration has ever tried. It's called Iranian freedom. Iranians have been protesting by the tens, hundreds, thousands, hundreds of thousands and millions, demanding the overthrow of the

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regime since the student protests in the late 1990s.... The same Iranian regime that threatens to annihilate Israel and destroy the U.S., the regime that pursues a nuclear arsenal while fielding a massive missile arsenal and proxy armies throughout the Middle East, turned their once-prosperous country into a corruption-ridden, impoverished wasteland. Food, water, medicine, shelter, money and work are all in short supply. Seventy percent of Iranians are destitute.

These Iranians ask for the U.S. to stop giving legitimacy to the regime by ending the farce of the ongoing nuclear talks in Vienna...The Raisi government is clearly not impressed by the Biden administration's genuflections in Vienna. The Iranians are playing to win. And for them, winning means achieving military nuclear capabilities, destroying Israel, bringing the U.S. to its knees and

exerting hegemonic power over the broader Islamic world.... Seven presidents have failed to successfully contend with the threat Iran poses to America. For Biden to have any chance of breaking that long-running record of failure, of averting a terrible war and blocking Iran's march to regional hegemony and a nuclear arsenal, he must adopt the only concerted strategy that has not yet failed: Sabotage, combined with the one option that has never been seriously tried—supporting the Iranian people's quest for freedom.

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Source: <https://www.newsweek.com/how-avert-nuclear-crisis-iran-opinion-1664446>, 31 December 2021.

**OPINION – Joshua Pollack**

**Why Do US Hypersonic Missile Tests Keep Failing? They're Going Too Fast**

A new arms technology is coming into its own, and the U.S. Defense Department is determined to achieve quick results in the field. Rather than select one or two concepts and usher them through the deliberate, highly structured process of research, development, testing, and evaluation, the Pentagon's program managers opt for multiple, competing efforts, and place them on a streamlined course: rapid prototyping and testing, to be followed by rapid production and deployment. The major defense contractors set forth as confidently as prospectors during the gold rush.

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The trouble is, the new weapons keep failing in tests, sometimes in fairly rudimentary ways that don't lend themselves to evaluating and

improving the design. The truncated development strategy seems to require a faith that American aerospace engineering can overwhelm all the usual difficulties by force of sheer élan. The results turn out differently.... In December, for example, the Air Force's Air-Launched Rapid Response Weapon (ARRW) failed in testing for the third time running in 2021, not even leaving the wing of the B-52 bomber carrying it. ARRW, remarkably, is supposed to become an operational weapon by 2023. Nor is it the only developmental hypersonic missile with a troubled test record.

But I could just as easily have been recalling U.S. efforts to build new ballistic missile defense systems in the 1990s. It's little remembered now, but BMD got off to a rocky start. After repeated disappointments, a trio of Pentagon agencies did something perhaps uncharacteristically forward-looking: it assembled a panel of seasoned experts to examine the situation, under the leadership of retired Air Force general Larry Welch. It even allowed the panel's reports to be released to the public. The first report of the Welch Panel made something of a splash at the time. It's worth recalling its frank account of the self-defeating nature of short timetables in complex technology development efforts: "These programs are pursuing very aggressive schedules, but these schedules are not supported by the state of planning and testing...the perceived urgency of the need for these systems has led to high levels of risk that have resulted in delayed deployments...."

The report's main recommendation—to put all BMD programs on "realistic schedules"—met with some predictable resistance, and we can't be sure

how much influence any single report or expert panel may have had. But it was surely vindicated after one of the most troubled BMD efforts shifted to a longer timeline. Prototypes of the THAAD system had produced four consecutive failures in hit-to-kill intercept tests by the time of the first Welch report in February 1998. After another two out of four test failures by August 1999, the program entered a new phase of development. Flight tests did not resume until 2005, but have yielded consistent successes since then—at least when the target missile has not failed. The first operational THAAD battery, originally scheduled to deploy in 1996, appeared in 2008.

We also don't know if all of the Welch Panel's judgments about the shortcomings of missile defense systems under development in the 1990s would apply equally to today's hypersonic weapons projects. But an April 2021 report from Congress's Government Accountability Office sounds some unhappily familiar notes.

Most of the efforts to develop these new missiles...use a new development authority that bypasses regular DOD "acquisition and requirement development policies and processes." These projects aim at building an initial prototype within six months and deploying an initial capability within five years. Among the many problems facing the development of hypersonic missiles, GAO noted, were "immature technologies and aggressive schedules."

The lesson should be clear: if it's genuinely important to deploy these new missile types, the Pentagon should adopt development schedules conducive to their success. If it won't do so, Congress should ask what drives it to repeat the

errors of the past.

Source: <https://www.defenseone.com/ideas/2022/01/why-do-us-hypersonic-missile-tests-keep-failing-theyre-going-too-fast/360276/>, 03 January 2022.

#### OPINION – Damian Ortega

### New Kid on the Grid: China's Price for Becoming the Poster Child for Nuclear Energy

The pace of China's nuclear power expansion can be described as blistering, and not just in the metaphorical sense. Looking back at the past decade, energy expert Daniel Yergin details that "China has the most aggressive nuclear-development program in the world." Having brought 29 nuclear power plants online from 2013 to 2018, and with ambitious goals to more than triple its generative capacity to 180 GW by 2035, China views the technology as a key pillar to its transition to a carbon neutral state in the fight against climate change. This Chinese commitment to developing capacity for low carbon alternatives should be encouraged.

However, it should also be a major cause for increased concern and scrutiny over safety by the global community.

To many people across the world, the possibility of a nuclear meltdown is an ominous cloud hanging over the potential low carbon gains of nuclear power. The incidents of Chernobyl, Three Mile Island, and Fukushima Daiichi have branded the lasting possibility of disaster onto the psyches of entire nations and communities. More than three decades after the disaster, the 2019 Netflix miniseries Chernobyl was met with widespread interest and popularity.

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After Three Mile Island, the U.S. cancelled the construction of 100 reactors. After Fukushima, both the Japanese and German governments abandoned efforts to include nuclear energy in their energy portfolios. As demonstrated, nuclear meltdowns have a chilling effect on the industry, which, barring any monumental breakthrough in renewables, will stunt the ability of states across the globe to reduce their reliance on fossil fuels and subsequent emissions. As the largest emitter of greenhouse gases and a country heavily reliant on coal, China and the international community have much to gain from the increase in its nuclear fleet. They also have much to lose.

COVID-19 exposed what many already know to be true of the dynamics of Chinese governance: the CCP suppresses and distorts the veracity of facts by exerting leverage over institutions under its influence. Transfer this institutional logic to a potential nuclear accident, and one runs into a serious problem. In order to effectively prevent and address nuclear accidents, states must maintain independent safety agencies. In 2010, IAEA labelled the Chinese nuclear safety regulator, the NNSA, as independent. However, no other Chinese regulatory agency has shown signs of independent authority past de jure labelling.

Additionally, according to the IAEA in 2016, the NNSA staffed only approximately 25 safety officials per reactor, while the U.S. Nuclear Regulatory Commission staffed 42 per reactor, above the world norm of 30 to 40. An adequate nuclear "safety culture" takes far longer to develop than does time to hire operating and inspections professionals. Such a staffing deficiency in the coming years of nuclear expansion places China and the region at a greater risk of potential reactor incidents

stemming from lack of technical expertise, quality control along nuclear supply chains, and greater operating stress. While the COVID-19 situation does not involve harmful radiation being dispersed into the environment, it gives us worthy context for how to imagine a hypothetical response to a nuclear incident in China.

To further complicate matters, Beijing's push for nuclear dominance is not relegated to the mainland. Elevated to the higher levels of national grand strategy in 2013, the "Going Out" plan is an integrated pillar of the BRI, wherein Chinese leadership envisions the export of 30 nuclear reactors to numerous Belt and Road states including Argentina, Czech Republic, Iran, Kenya, South Africa, and Romania. As part of the plan, both flagship nuclear power companies, the China National Nuclear Corporation (CNNC) and the China General Nuclear Power Group (CGN), champion the jointly developed Hualong One reactor abroad. With a generative capacity of approximately one GW, the third-generation pressurized water reactor is a potent tool in the fight against climate change, as it offsets seven million tons of CO<sub>2</sub> per year in comparison to a coal-fired plant. The Hualong One reactor has already been deployed for two sites in Pakistan: Chasma 5 and Karachi 2. By exporting nuclear power abroad, China would ensure bilateral energy ties lasting decades with the countries in the BRI and position itself at the forefront of defining nuclear safety and proliferation norms. Beyond any geopolitical concerns, Chinese domestic construction and operation safety standards are likely to be imported by these countries. Deficient atomic energy standards, like radioactivity, do not stop at the border and should be a tremendous matter of concern for the international community.

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Of course, this is not to say that authoritarian regimes like China provide the only circumstances under which a nuclear meltdown could occur. The mistakes leading up to Fukushima in Japan and Three Mile Island in the United States are counterfactual to this notion, and Beijing has, at least, vocally committed to addressing safety shortcomings in its 2019 white paper, "Nuclear Safety in China". Additionally, the development of new technologies and adoption of better technical standards, such as SMRs, will help to standardize operations and reduce the room for error. Already, the CNNC is actively researching and developing their SMR reactor, the Linglong One, which has the potential to replace 100 MW of power generation on the grid. Yet the dynamics of Chinese centralized governance and its insufficient dedication to safety still stand, leaving tremendous room for error.

**To ensure a reduction in risk, China should take steps to insulate the NNSA from political tampering by removing it from under the Ministry of Environmental Protection's authority and condition nuclear support for states in the BRI on adherence to all IAEA safety protocols.**

To ensure a reduction in risk, China should take steps to insulate the NNSA from political tampering by removing it from under the Ministry of Environmental Protection's authority and condition nuclear support for states in the BRI on adherence to all IAEA safety protocols. Moreover, the United States, despite the ongoing geopolitical competition, should seek to help China build a robust safety culture and staffing capacity in a bilateral dialogue between their respective regulatory agencies, wherein the United States helps it institute the best practices. As the heir-apparent to the United States and France in terms of total nuclear capacity, China shoulders a significant burden for the future of nuclear energy adoption. It must maintain and improve its safety standards and procedures across the board while balancing its burning desire for international prestige and geopolitical

**In the study done by a South African research institute, the Human Sciences Research Council, in 2013, it was reported that 42% of South Africans know little to nothing about nuclear energy while 22% are undecided on whether or not they are in favour or against it.**

influence. There isn't much room for error. A single mistake in a reactor along the densely populated Southeast Coast in, say, Guangdong province could spell disaster with countless lives lost and another costly slowdown in the deployment of nuclear energy. This would not only affect China, but the greater international community, a cost China and the world cannot afford with the ensuing climate crisis.

Source: <https://www.iar-gwu.org/blog/iar-web/new-kid-on>, 04 January 2022.

**OPINION – Princy Mthombeni**

**Nuclear Energy is Critical to Africa's Agenda for Sustainable Development**

Having been in the nuclear energy industry for more than ten years, I came to a realisation that many people do not realise the impact of energy in our daily lives and in strengthening our economies. Therefore, policymakers and those in power end up pushing energy policies that have little to no impact on the development of the life of citizens and their country. The gap between scientists and ordinary citizens remains wide, so much so that science facts, particularly when it comes to nuclear energy, are overpowered by rhetoric. In the study done by a South African research institute, the Human Sciences Research Council, in 2013, it was reported that 42% of South Africans know little to nothing about nuclear energy while 22% are undecided on whether or not they are in favour or against it. Furthermore, the study showed that only 18% of the group is unfavourable towards nuclear energy. In addition, the survey showed that the levels of knowledge, understanding and attitudes vary in line with educational levels, living standards

levels, geographical location, gender and race.

Nuclear communications in Africa are not well established. It is a subject matter that is still controversial in our communities and few professionals are trained in the subject. This makes the process of reaching many people a bit difficult. However, as a nuclear communications specialist, I am always looking for opportunities to collaborate and partner with others who are well versed in the dynamics on the continent

to develop communication strategies whose messaging would put more emphasis on demystifying nuclear technology through public education and raising awareness in order to change perceptions towards nuclear energy. These communication strategies are not developed in isolation, but speak to the goals of *African Agenda 2063* for sustainable development by located nuclear energy as a driving force toward Africa's prosperity.

Access to quality energy remains a daunting challenge for Africa. Tighter fiscal environment only serves to exacerbate the problem for the economy of countries where there is little diversification. The African Development Bank reported that over 640 million people in Africa do not have access to energy, corresponding to an electricity access rate for African countries at just over 40%, the lowest in the world. According to research by Oxfam in its 2017 report, *The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers*, 792 million people are forced to cook with traditional biomass on unimproved stoves. While efforts at electrification are expected to bring down the

number of people who do not have access to electricity, the number of people using unimproved cooking facilities in Africa is expected to increase through 2030.

**Nuclear power, as a source of energy that is clean, reliable, dispatchable and baseload, is key in addressing the energy poverty on the African continent while mitigating against climate change issues. In addition, because this energy source is baseload, it will allow the continent to industrialise quickly, solving the triple threats of poverty, inequality and unemployment in the process.**

to shape a better energy future for Africans. This in turn directs attention to the diversity of options emerging for progressing global net-zero carbon energy transition pathways that will benefit the most vulnerable people on the planet. Nuclear power, as a source of energy that is clean, reliable, dispatchable and baseload, is key in addressing the energy poverty on the African continent while mitigating against climate change issues. In addition, because this energy source is baseload, it will allow the continent to industrialise quickly, solving the triple threats of poverty, inequality and unemployment in the process. For a continent as youthful as Africa, with a population expected to triple in the next 30 years, it is important to make

**There is a misplaced idea held by some people within the global community that Africa's relative lack of legacy infrastructure makes it the perfect canvas on which to paint a green energy future. This group of people are putting restrictions on the energy choices of poor countries who are continuously trapped in a state of energy poverty, socioeconomic challenges and underdevelopment.**

Clearly a light bulb does not constitute adequate access to energy when there are so many people that desperately need clean, affordable, reliable and equitable access to energy supply for clean water, public health and jobs. This energy crisis demands that Africa should take the opportunity to shape a better energy future for Africans. This in turn directs attention to the diversity of options emerging for progressing global net-zero carbon energy transition pathways that will benefit the most vulnerable people on the planet. Nuclear power, as a source of energy that is clean, reliable, dispatchable and baseload, is key in addressing the energy poverty on the African continent while mitigating against climate change issues. In addition, because this energy source is baseload, it will allow the continent to industrialise quickly, solving the triple threats of poverty, inequality and unemployment in the process. For a continent as youthful as Africa, with a population expected to triple in the next 30 years, it is important to make sure that policymakers, decision takers and the general public are educated regarding the benefits of nuclear energy so that we can take advantage of this energy source for the betterment of our countries and the continent at large.

There is a misplaced idea held by some people within the global community that Africa's relative lack of legacy infrastructure makes it the perfect canvas on which to paint a green energy future. This group

of people are putting restrictions on the energy choices of poor countries who are continuously trapped in a state of energy poverty, socioeconomic challenges and underdevelopment. South Africa is the only sub-Saharan African country to have achieved significant success at increasing access to electricity. However, the country's experience reveals the importance of local contextual factors, as well as the complicated ways in which local political and economic incentives play out in driving and frustrating effective management of the power sector. The scale of South Africa's success at expanding access to electricity is largely because of the country's access to abundant cheap coal. Coal-fired-power-plants provide dispatchable energy as long as the fuel is available.

Coal plays a significant role in countries such as South Africa today, and will continue to do so for many years to come. Therefore, strategies for transitioning to greener energy sources should consider the lives and livelihoods of thousands of people who are employed in this sector, and the rest of the people whose lives depend on it. There are advancements already being made in the development of SMRs which provide an opportunity that is already being explored to replace coal-powered power plants by retrofitted SMRs instead of shutting the coal-powered plants permanently. This will make sure that the local economies of communities that are dependent on coal continue to remain active and thrive. SMRs are ideal for this purpose because not only do they require less initial capital, but they are also siting flexible and scalable....

African states should pursue an energy mix that includes nuclear power as part of the strategy to move Africa closer to achieving its vision for the year 2063. Africa's transition to cleaner sources of electricity should be systematic and it must be done in a manner that is mindful of social and

economic as well as environmental considerations. Nuclear as a source of energy will play a critical role as a bridge to achieving a green economy in a responsible way, thus meeting the aspiration of "a prosperous Africa based on inclusive growth and sustainable development", the Africa we want.

In order to achieve the full benefits of nuclear power, the African continent will require massive support from the global community, in particular the global nuclear industry. Already the IAEA is assisting African countries who are member states to develop their regulatory frameworks, develop human resources for nuclear power plants and others. This noble gesture is lauded and

welcomed. However, in order for these African countries and Africa at large to realise its nuclear potential, stumbling blocks such as capital funding and barriers to financing need to be removed. In addition, more partnerships need to be developed in order to achieve skills and technology transfer while making sure that issues such as safeguards, safety

and security, including counter-terrorism, are addressed to guarantee the safety of nuclear power plants. Africa with its resources is already on a path to achieve nuclear development and is already unlocking this potential on the continent. The global communities should enable an environment that is conducive to fast-track this trajectory.

Source: <https://www.world-nuclear-news.org/Articles/Viewpoint-Nuclear-energy-is-critical-to-Africas-ag>, 06 January 2022.

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## **NUCLEAR STRATEGY**

### **CHINA**

#### **China to 'Modernise' its Nuclear Arsenal**

China said it will continue to "modernise" its nuclear arsenal and called on the U.S. and Russia

to reduce their own stockpiles a day after global powers pledged to prevent such weapons from spreading. In a rare joint statement setting aside rising West-East tensions, the U.S., China, Russia, Britain and France reaffirmed their goal of creating a world free of atomic weapons and avoiding a nuclear conflict. The five nuclear powers also committed to full future disarmament from atomic weapons, which have only been used in conflict in the U.S. bombings of Japan at the end of the Second World War.

But squaring that rhetoric with reality will not be easy at a time of spiralling tensions between those same global powers not seen since the Cold War. There are growing global concerns about China's rapid military modernisation, especially after its armed forces last year announced they had developed a hypersonic missile that can fly at five times the speed of sound. The U.S. has also said China is expanding its nuclear arsenal with as many as 700 warheads by 2027 and possibly 1,000 by 2030.

On January 4, China defended its nuclear weapons policy and said Russia and the U.S. — by far the world's largest nuclear powers — should make the first move on disarmament. "The U.S. and Russia still possess 90% of the nuclear warheads on Earth," Fu Cong, Director General of the department of arms control at the Chinese Foreign Ministry, said. "They must reduce their nuclear arsenal in an irreversible and legally binding manner." Mr. Fu dismissed U.S. claims that China was vastly increasing its nuclear capabilities. "China has always adopted the no first use policy and we maintain our nuclear capabilities at the minimal level required for our national security," he said. But he said Beijing would "continue to modernise its nuclear arsenal for reliability and safety issues".

**Taiwan, Ukraine:** Ties between Beijing and Washington have been strained over a series of

issues including China's intentions to take Taiwan, which it claims as part of its territory, by force if necessary. Beijing's sabre-rattling towards Taiwan has reached new heights under President Xi Jinping... Mr. Fu dismissed speculation over the possibility of deploying nuclear weapons near the Taiwan Strait. "Nuclear weapons are the ultimate deterrent, they are not for war or fighting," he said. While the United States and Russia have had a formal strategic stability dialogue since the days of the Cold War, producing several disarmament agreements, that is not the case between Washington and Beijing.

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In Europe, tensions with Moscow have deteriorated over a Russian troop build-up close to the Ukrainian border. That has raised fears that the Kremlin, worried by the possibility of further eastward expansion of NATO, is planning a new attack on its pro-Western neighbour. Crunch talks

between Russia and the U.S. on European security are expected in Geneva on January 10. Against this backdrop, [the] joint statement on nuclear weapons was a rare moment of consensus between the UN's five permanent Security Council members....

*Source: <https://www.thehindu.com/news/international/china-to-modernise-its-nuclear-arsenal/article38119276.ece>, 04 January 2021.*

## **INDIA-PAKISTAN**

### **India, Pakistan Exchange List of Nuclear Installations**

Pakistan and India on January 1 exchanged a list of their nuclear installations that cannot be attacked in case of an escalation in hostilities, as part of an annual ritual that has been in practice between the two neighbours for more than three decades...The lists of nuclear installation and facilities were exchanged as per the provisions of the Article-II of the Agreement on Prohibition of Attacks against Nuclear Installations and

Facilities, signed on December 31, 1988 and ratified on 27 January 1991. According to this agreement, both countries have to inform each other of the nuclear facilities. This practice of exchanging lists has continued since January 1, 1992. The exchange of the lists came amid strain in ties between the two countries over the Kashmir issue as well as cross-border terrorism. The list of nuclear installations and facilities in Pakistan was officially handed over to a representative of the Indian High Commission at the Ministry of Foreign Affairs at 1030 hours PST on January 1. Similarly, the Indian Ministry of External Affairs in New Delhi handed their list of nuclear installations and facilities to a representative of the Pakistan High Commission at 1100 hours IST....

Source: <https://www.thehindu.com/news/national/india-pakistan-exchange-list-of-nuclear-installations-prisoners/article38086493.ece>, 01 January 2022.

## **NORTH KOREA**

### **Hypersonic Missile Newly Developed by Academy of Defence Science Test-Fired**

The Academy of Defence Science of the DPRK test-fired a hypersonic missile on 5 January. Leading officials concerned of the Department of the Munitions Industry of the Central Committee of the Workers' Party of Korea and the sector of national defence science watched it. The successive successes in the test launches in the hypersonic missile sector have strategic significance in that they hasten a task for modernizing strategic armed force of the state put forward at the 8th Party Congress and help fulfill the most important core task out of the five top priority tasks for the strategic arms sector in the five-year plan.

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The Party Central Committee expressed great satisfaction at the result of the test-firing and extended warm congratulations to the relevant sector of the national defence science research.

In the test launch the academy reconfirmed the flight control and stability of the missile in the active-flight stage and assessed the performance of the new lateral movement technique applied to the detached hypersonic gliding warhead. Having been detached after its launch, the missile made a 120 km lateral movement in the flight distance of the hypersonic gliding warhead from the initial launch azimuth to the target azimuth and precisely hit a set target 700 km away. The reliability of fuel ampoule system under the winter weather conditions was also verified. The test launch clearly demonstrated the control and stability of the hypersonic gliding warhead which combined the multi-stage gliding jump flight and the strong lateral movement.

Source: [http://rodong.rep.kp/en/index.php?strPageID=SF01\\_02\\_01&newsID=2022-01-06-0001](http://rodong.rep.kp/en/index.php?strPageID=SF01_02_01&newsID=2022-01-06-0001), 06 January 2022.

### **North Korea Claims Second Successful Hypersonic Missile Test in a Week**

North Korean leader Kim Jong-un watched the successful launch of the country's second hypersonic missile test in less than a week after, as he vowed to bolster the country's nuclear weapons program....

**Why it Matters:** South Korea's military, which detected the suspected ballistic missile into the eastern sea, said [the] launch was assessed to be "more advanced" than the Jan. 5 one...Kim's vow is the latest indication that North Korea does not intend to rejoin stalled denuclearization talks,

and came as the UN Security Council met in New York to discuss [the] test.

**What they're Saying:** The U.S. Indo-Pacific Command said in a statement that it was consulting closely with allies and had determined that the latest launch was of no "immediate threat to U.S. personnel or territory, or to our allies," but it "highlights the destabilizing impact" of Pyongyang's "illicit weapons program." On 10 January, six countries, including the U.S., U.K. and Japan, issued a statement condemning [the] launch and calling on North Korea "to refrain from further destabilizing actions...and engage in meaningful dialogue towards our shared goal of complete denuclearization."

Source: <https://www.axios.com/north-korea-fires-second-suspected-missile-six-days-66f5065f-f509-46d7-9f76-9cd211317a2f.html>, 12 January 2022.

## RUSSIA

### The First Regiment of Sarmat ICBMs will Take Up Combat Duty by the End of 2022

In the Uzhur missile formation, located in the Krasnoyarsk Territory, work has been launched to prepare the head missile regiment for rearmament with the new Sarmat missile system. For these purposes, the corresponding infrastructure is being prepared in the re-equipped regiment. Since the beginning of 2021, serial equipment manufactured at industrial enterprises has been supplied to the compound, the installation of silo launchers and a unified command post has been organized. Starting from 2022, it is planned to phase out the stationary-based Voevoda heavy-class missile system from the Strategic Missile Forces grouping and replace it with the Sarmat.

In a few years, the Strategic Missile Forces will step over the line beyond which there will be no

obsolete Soviet-made missile systems in the combat composition. Currently, the Strategic Missile Forces are armed with stationary silo-based missile systems: Avangard, Voevoda, Stilet, Topol-M and Yars. The mobile-based grouping includes the Topol, Topol-M and Yars mobile ground-based missile systems.

**Starting from 2022, it is planned to phase out the stationary-based Voevoda heavy-class missile system from the Strategic Missile Forces grouping and replace it with the Sarmat.**

Source: [https://structure.mil.ru/structure/forces/strategic\\_rocket/news/more.htm?id=12402295@egNews](https://structure.mil.ru/structure/forces/strategic_rocket/news/more.htm?id=12402295@egNews), 08 January 2022.

## BALLISTIC MISSILE DEFENCE

### JAPAN

#### Japan Set to Develop Railguns to Counter Hypersonic Missiles

The Japanese Defense Ministry will develop a means to intercept hostile missiles using magnetically powered projectiles...as the nation scurries to respond to the hypersonic weapons being developed by China, North Korea and Russia. The ministry is focusing on railgun technology that can launch projectiles with power generated when an electric current is applied to a magnetic field. The projectiles are faster than those shot from conventional intercept systems and can be fired continuously. Together with long-range missiles, the next-generation system will provide Japan with multilayered intercept capabilities.

Hypersonic weapons, which travel faster than five times the speed of sound, are thought to be close to coming into practical use. In November...China was able to fire a missile from a glide vehicle traveling at hypersonic speeds over the South China Sea. The speed of sound is about 343 meters per second. Other countries apparently have similar technology. North Korea has claimed that a missile it launched into the Sea of Japan in September was a hypersonic device, and Russian

Putin plans to deploy hypersonic cruise missiles this year.

Japanese policymakers see hypersonic weapons as the next generation of military weaponry and believe the country must urgently strengthen its deterrence, especially in regard to China.

Japan is developing a railgun system not to intercept missiles but to deter any from being shot in the first place.... Hypersonic missiles fly along irregular trajectories, so conventional intercept systems, which attack ballistic missiles flying on parabolic paths, cannot stop them. The new system will reinforce Japan's missile response capabilities, which have been described by some experts as the "hole in Japan's defense." In addition to adding railgun interceptors to its existing missile defense system, Japan is considering long-range missiles that would allow it to return volleys from a distance. Together, the systems would create a three-tiered deterrent....

Existing intercept missiles are limited to speeds of about 1,700 meters per second. Interceptors fired from electromagnetic railguns are expected to reach speeds of over 2,000 meters per second. During the research stage, a prototype achieved a speed of nearly 2,300 meters per second. Increasing speeds raises the chances of interceptor being able to hit another hypersonic missile before it reaches its target. Being able to fire interceptors in rapid succession also improves the chances of hitting a missile traveling more than five times the speed of sound.

Railguns can also shoot interceptors at different speeds. By manipulating the amount of electrical power, they apply, operators can adjust how fast an interceptor travels. Such decisions would

depend on the speed of incoming missiles. It is difficult to manipulate the velocity of missiles fired with conventional propellants. The small size of a railgun's "bullets" also gives them a degree of stealth....

Source: <https://asia.nikkei.com/Politics/Japan-set-to-develop-railguns-to-counter-hypersonic-missiles>, 04 January 2022.

**EMERGING TECHNOLOGIES AND DETERRENCE**

**CHINA**

**China's 'Artificial Sun' Burns at 70 MILLION Degrees for 20 Minutes in New Experiment Five Times Hotter Than Real Sun**

**Railguns can also shoot interceptors at different speeds. By manipulating the amount of electrical power, they apply, operators can adjust how fast an interceptor travels. Such decisions would depend on the speed of incoming missiles. It is difficult to manipulate the velocity of missiles fired with conventional propellants.**

Researchers have been busy running tests at the Experimental Advanced Superconducting Tokamak (EAST), a nuclear fusion reactor facility, to make its auxiliary heating system more "hot" and "durable".... The facility is called an "artificial sun" because it mimics the nuclear fusion reaction that powers the real sun - which uses hydrogen and deuterium gases as fuel. Designed and developed by the Chinese, the EAST has been used since 2006 by scientists from all around the world to conduct fusion-related experiments. But the project has just hit an important milestone. Researchers managed to run the "artificial sun" at

**Researchers managed to run the "artificial sun" at 70 million degrees for as long as 1,056 seconds, or 17 minutes, 36 seconds... The real sun hits temperatures of around 15 million degrees at its core.**

70 million degrees for as long as 1,056 seconds, or 17 minutes, 36 seconds... The real sun hits temperatures of around 15 million degrees at its core....

More than 10,000 Chinese and foreign scientific researchers have worked together to bring to life the "artificial sun". The EAST harnesses extremely high temperatures to boil hydrogen isotopes into a plasma, fusing them together and releasing

energy. China has already spent around £701 million on the project....

Source: <https://www.the-sun.com/tech/4376795/china-artificial-sun-experiment-five-times-hotter-real-sun/>, 01 January 2022.

### China Says it has Hypersonic Missiles with Heat-Seeking Tech – Years before US

Chinese scientists say they have developed next-generation hypersonic weapons with technical breakthroughs in infrared homing technology – which the US military may not have until 2025. Heat-seeking capability allows Chinese hypersonic missiles to home in on almost any target – including stealth aircraft, aircraft carriers and moving vehicles on the street – with unprecedented accuracy and speed....

The first generation of hypersonic weapons were designed to penetrate missile defence systems and hit fixed targets on the ground at five times the speed of sound or faster. Although China and Russia had deployed some hypersonic missiles, a popular opinion elsewhere was that these weapons had little practical value unless a country wanted to start a nuclear war. But conventional warfare could be transformed by a hypersonic missile being able to search for, identify and lock on to a target based on its heat signature when flying at low altitudes where the air is thicker....

According to the US Air Force, about 90 per cent of all the aircraft it has lost since the 1980s were shot down with heat-seeking missiles, and stealth fighters such as the F-22 could also be targets because their coating materials heat up easily in flight.... A ground-to-air hypersonic missile could catch up with and destroy an F-22 in a matter of seconds if it fired a missile or dropped a bomb from close range.

Heat sensing at hypersonic speed is not easy, but China has made “a series of core technology breakthroughs that were proven effective in tests”.... The country’s hypersonic infrared missiles had already been used in a number of test flights.... “Precision guidance with infrared imaging technology is a force multiplier for hypersonic weapons”.... “If one party takes the lead in processing mature hypersonic weapons, this party will have the absolute advantage of asymmetric attacks. With effective hypersonic precision strike weapons, the critical value

of ‘strategic depth’ in traditional warfare will no longer exist. All the critical political, economic and military assets of a country will be at risk.”

At high Mach numbers, the surface of a missile becomes so hot that a target’s heat signal can be overwhelmed by background noise. The infrared window would crack because no glass material could withstand the extreme heat and shock waves. Scientists from around the world had

proposed ways to lower the temperature, such as splashing liquid over the window or planting cooling tubes under the glass. Most of these ideas were ineffective or too complex.... The Chinese scientists put an air-

blowing device in front of the infrared window to generate a thin membrane of cold air, reducing the heat on the glass. Some research teams in other countries had tried this approach but failed because the cooling air could trigger strong turbulence that distorted the heat signal, giving a fuzzy, flickering and less accurate location of the target.

Yi’s team solved this problem with a number of breakthroughs. They developed a compact, lightweight device that could generate an extremely cold stream of inert gas at more than three times the speed of sound to reduce signal

**Heat-seeking capability allows Chinese hypersonic missiles to home in on almost any target – including stealth aircraft, aircraft carriers and moving vehicles on the street – with unprecedented accuracy and speed.**

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distortion. They managed to squeeze 40 micro vortex generators into the air-cooling device to produce air flows that could break apart the turbulence. They also developed a new mathematical model that helped them to better predict and eliminate the optical distortion as missiles accelerated and homed in on targets at wide attack angles. This progress came from a large number of experiments that they conducted in the KD-01 wind tunnel, a world-leading research facility for hypersonic infrared homing technology in Changsha. The wind tunnel used a unique technology that allowed researchers to observe turbulence over glass with a resolution more than 120 times higher than that of facilities using American technology....

The United States had previously been a world leader in heat sensing.... In the 1980s and 90s, the US government and military invested an enormous amount of resources in the development of high-speed infrared homing technology that was used to develop missile defence systems such as the THAAD system. However, these heat sensors worked only in thin air at high altitudes. Last February, the US Defence Advanced Research Projects Agency asked numerous defence contractors, including General Electric and Lockheed Martin, to develop infrared sensors for hypersonic missiles. According to their contracts, the development and testing of their sensors will take at least four years.

*Source: <https://www.scmp.com/news/china/military/article/3161762/china-says-it-has-hypersonic-missiles-heat-seeking-tech-years>, 31 December 2021.*

## **RUSSIA**

### **Russia Test-Fires New Hypersonic Tsirkon Missiles from Frigate, Submarine**

Russia test-fired around 10 new Tsirkon (Zircon) hypersonic cruise missiles from a frigate and two

more from a submarine.... on 31 December. Russian President Putin has lauded the weapon as part of a new generation of unrivalled arms systems. Putin has called a missile test... "a big event in the country's life", adding that this was "a substantial step" in increasing Russia's defence capabilities. Some Western experts have questioned how advanced Russia's new generation of weapons is, while recognising that the combination of speed, manoeuvrability and altitude of hypersonic missiles makes them difficult to track and intercept. Putin announced an array of new hypersonic weapons in 2018 in one of his most bellicose speeches in years, saying they could hit almost any point in the world and evade a U.S.-built missile shield.

*Source: <https://www.reuters.com/business/aerospace-defense/russia-test-fires-new-hypersonic-tsirkon-missiles-frigate-submarine-2021-12-31/>, 31 December 2021.*

## **NUCLEAR ENERGY**

### **CHINA**

#### **China Powers up the World's First Commercial Onshore Small Modular Nuclear Reactor**

China connected its first commercial onshore small modular nuclear reactor to its power grid, making it the first country in the world to draw power from such a machine.... China Huaneng Group Co.'s 200-megawatt unit 1 reactor at Shidao Bay is connected to the grid in the Shandong province. The company is also developing a second reactor, which is scheduled to go into full operation next year following tests. The 200-megawatt SMR is roughly a fifth of the size of China's first proprietary reactor design, called Hualong One. Its small size allows for greater scalability as well as reduced operations and deployment costs. The new modular nuclear reactor is the world's first pebble-bed modular high-temperature gas-cooled reactor. Instead of heating up water, it heats helium to produce

energy. The machine is designed to quickly shut down if an error occurs.

**China will Invest \$440 Billion in Nuclear Power Over the Next 15 Years:**

China is the world's largest investor in nuclear power, with estimations suggesting it will pay up to 440 billion dollars towards building new nuclear power plants over the next 15 years, allowing it to overtake the U.S. as the world's top generator of nuclear electricity. The country is also investing heavily in nuclear fusion, which promises to end our reliance on fossil fuels by mimicking the reaction of the sun and stars on Earth....

According to reports last year, other countries, including Romania, in Europe, are also developing SMR's with a view to easing the transition away from fossil fuels. Rolls-Royce is also developing SMRs to help the U.K. meet its climate goals. In a November interview with Interesting Engineering, Coventry University Professor Michael Fitzpatrick explained that SMRs can be used alongside new renewable energy solutions to help stabilize the grid in the future. "SMRs allow you to do a mix where the endpoint is the same. The same ability to meet energy demands, but at different levels of commitment. It's a lower up-front cost, with a shorter build time," he said. For now, China is the only country reaping the substantial benefits of SMRs.

Source: <https://interestingengineering.com/the-worlds-first-small-modular-nuclear-reactor-is-sending-power-to-the-grid>, 04 January 2022.

**GERMANY**

**Germany Shuts Down Half of its Remaining Nuclear Plants**

Germany on 31 December is shutting down half of the six nuclear plants it still has in operation, a

year before the country draws the final curtain on its decades-long use of atomic power. The decision to phase out nuclear power and shift from fossil

**Other countries, including Romania, in Europe, are also developing SMR's with a view to easing the transition away from fossil fuels. Rolls-Royce is also developing SMRs to help the U.K. meet its climate goals.**

fuels to renewable energy was first taken by the centre-left government of former Chancellor Gerhard Schroeder in 2002. His successor, Angela Merkel, reversed her decision to extend the lifetime of Germany's nuclear plants in the wake of the 2011 Fukushima disaster in Japan and set 2022 as the final deadline for shutting them down.

The three reactors now being shuttered were first powered up in the mid-1980s. Together they provided electricity to millions of German households for almost 40 years. One of the plants – Brokdorf, located about 40 kilometres (25 miles) northwest of Hamburg on the Elbe River – became a particular focus of anti-nuclear protests that were driven by the 1986 Chernobyl catastrophe in the Soviet Union.... Some in Germany have

**Germany on 31 December is shutting down half of the six nuclear plants it still has in operation, a year before the country draws the final curtain on its decades-long use of atomic power. The decision to phase out nuclear power and shift from fossil fuels to renewable energy was first taken by the centre-left government of former Chancellor Gerhard Schroeder in 2002.**

called for the decision to end the use of nuclear power to be reconsidered again because the power plants already in operation produce relatively little carbon dioxide. Advocates of atomic energy argue that it can help Germany meet its climate targets for reducing greenhouse gas emissions.

But the German government said...that decommissioning all nuclear plants next year and then phasing out the use of coal by 2030 will not affect the country's energy security or its goal of making Europe's biggest economy "climate neutral" by 2045. "By massively increasing renewable energy and accelerating the expansion of the electricity grid we can show that this is possible in Germany," Economy and Climate Minister Habeck said. Several of Germany's neighbours have already ended nuclear power or announced plans to do so, but others are sticking with the technology. This has prompted concerns of a nuclear rift in Europe, with France planning

to build new reactors and Germany opting for natural gas as a compromise until enough renewable power is available, and both sides arguing their preferred source of energy be classed as sustainable.

Germany's remaining three nuclear plants — Emsland, Isar and Neckarwestheim — will be closed by the end of 2022. While some jobs will be lost, utility company RWE said more than two-thirds of the 600 workers at its Gundremmingen nuclear power station will continue to be involved in post-shutdown operations through to the 2030s. Germany's nuclear power companies will receive almost \$3bn for the early shutdown of their plants. Environment Minister Lemke has dismissed suggestions that a new generation of nuclear power plants might prompt Germany to change course yet again. "Nuclear power plants remain high-risk facilities that produce highly radioactive atomic waste," she told the Funke media group. A final decision has yet to be taken about where to store tens of thousands of tonnes of nuclear waste produced in German power plants. Experts say some material will remain dangerously radioactive for 35,000 generations.

Source: <https://www.aljazeera.com/news/2021/12/31/germany-shuts-down-half-of-its-remaining-nuclear-plants>, 31 December 2021.

## **JAPAN**

### **Japan Seeks Nuclear Fusion Reactor Prototype by Mid-Century**

Japan aims to hammer out its very first research and development strategy for nuclear fusion by summer...with the goal of achieving a prototype

reactor by around 2050. The Cabinet Office will set up a forum for discussions with experts as early this month to create a strategy. The plan will be

to work with the private sector, including financial support for small companies and start-ups.

Nuclear fusion generates power by recreating the same processes that occur inside the sun and does not produce carbon dioxide or other global warming gases. No highly radioactive waste is produced. Fusion reactors now being envisioned will be fueled by such materials as deuterium and lithium, which are abundant in seawater and can be obtained without depending on imports. Prime Minister Kishida mentioned nuclear fusion in connection with a clean energy strategy in a press conference on January 4.

Japan is working with the U.S. and other countries on the International Thermonuclear Experimental Reactor (ITER), which is now being built in France. The project aims to see if the technology is technically feasible, though it will not

generate electricity. Assembly began in 2020 with completion slated for 2025. Japan plans to increase the competitiveness of its domestic industry by promoting research and development of equipment needed for fusion power generation. The technology acquired by participating in ITER will be applied to a domestically produced prototype reactor. The hope is that in the future it will become a baseload source for stable power supply. In Japan, small and mid-sized companies are working on making components for nuclear fusion reactors. The government will consider support for them to boost technological innovation. Investment in nuclear fusion ventures is growing in the U.S., and in the U.K., a "government fusion strategy" is in place and there

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Source: <https://asia.nikkei.com/Business/Technology/Japan-seeks-nuclear-fusion-reactor-prototype-by-midcentury>, 09 January 2022.

## **PAKISTAN**

### **Pakistan Loads Fuel in Chinese-Assisted Karachi Nuclear Power Plant Unit-3**

Pakistan has completed the loading of fuel at its Chinese-assisted Karachi Nuclear Power Plant Unit-3 to celebrate three decades of cooperation with its all-weather ally China.... After getting a formal permit from the Pakistan Nuclear Regulatory Authority (PNRA), completed the fuel loading process of the second 1,100-megawatt nuclear power plant on December 31.... The ceremony to mark three decades of cooperation between China and Pakistan in the field of peaceful use of nuclear energy as well as of the fuel loading of Karachi Nuclear Power Plant Unit-3, commonly known as K-3, was attended by top officials of nuclear energy related organisations from the two countries. K-3 is in the final stages of commissioning and after operational and safety tests, the plant is expected to begin commercial operation by the end of March 2022.

A new era in the nuclear power development programme of Pakistan commenced with the signing of the 'Agreement for Cooperation in Peaceful Uses of Nuclear Energy' between the governments of China and Pakistan in 1986.... However, the first concrete step in the remarkable journey was taken 30 years ago when China National Nuclear Corporation (CNNC) and PAEC signed the contract for construction and installation of a 325-megawatt PWR at Chashma on December 31, 1991... The cooperation strengthened with the construction of three more nuclear power plants at Chashma Nuclear Power Generation Station (CNPGS) site. The contract for

the construction of two more units having a generation capacity of 1,100 megawatts each near Karachi was signed on February 18, 2013. These units are called Karachi Nuclear Power Plant Unit-2 and 3 (K-2 and K-3).

After the ground-breaking of K-2 and K-3 in November 2013, the construction of K-3 was formally started. Despite the COVID-19 pandemic, both Pakistan and China faced all odds and continued the construction work. K-2 successfully started commercial operation on May 21, 2021, and now K-3 is expected to do so by the end of March 2022. K-2 and K-3 are pressurised water reactors based on the Chinese ACP-1000 design and are generation-three plants equipped with advanced safety features. With the connection of K-2 and K-3 into the national grid, the share of nuclear power in the energy mix of Pakistan will exceed 10 per cent...

**Despite the COVID-19 pandemic, both Pakistan and China faced all odds and continued the construction work. K-2 successfully started commercial operation on May 21, 2021, and now K-3 is expected to do so by the end of March 2022. K-2 and K-3 are pressurised water reactors based on the Chinese ACP-1000 design and are generation-three plants equipped with advanced safety features.**

Source: <https://www.eastmojo.com/world/2022/01/02/pakistan-loads-fuel-in-chinese-assisted-karachi-nuclear-power-plant-unit-3/>, 02 January 2022.

## **NUCLEAR COOPERATION**

### **JAPAN-USA**

#### **Japan Nuclear Research Set to Revive on U.S. Fast-Reactor Project**

Reviving its research efforts in fast reactors, Japan will take part in a U.S.-led project to develop the facilities, seeking access to technology crucial to recycling spent nuclear fuel. The Japan Atomic Energy Agency and Mitsubishi Heavy Industries are slated to collaborate in an initiative led by the U.S. Department of Energy and nuclear energy start-up TerraPower, which is backed by Microsoft co-founder Bill Gates. The two sides will draft a memorandum of understanding...with details to be hammered out. TerraPower aims to build a 345 MW fast reactor in the state of Wyoming,

targeting a 2028 launch of operations. It is receiving nearly \$2 billion in subsidies from the U.S. government, covering roughly half the project's cost.

Fast reactors involve fast neutrons sustaining a fission chain reaction, making them more efficient than conventional nuclear reactors. They are considered indispensable to the nuclear fuel cycle involving the recycling of plutonium from spent fuel. Japan pulled the plug on its Monju fast breeder reactor prototype in Fukui Prefecture in 2016, shifting focus to work with France on its Astrid fast reactor project. But with Paris shelving those plans, Tokyo was left with no prospects for continuing research on fast reactors.

The U.S., which has also not been fully engaged in fast reactor development, is said to have sought Japan's cooperation on the TerraPower project. Japan is well-positioned to convey lessons following a sodium coolant leak at Monju and to provide data from test operating the Joyo fast reactor. The Athena sodium experimental facility in Ibaraki Prefecture will serve as a point of reference as well. Japan's 2018 road map for fast reactor development set forth cooperation with the U.S., and the two sides reached an agreement the following year to work together on developing a test reactor. However, a fuel reprocessing plant in Aomori Prefecture, originally slated for completion in 1997, has yet to be finished. Meanwhile, the total cost of reprocessing has ballooned to about 14 trillion yen (\$122 billion). Questions about where to ultimately store the spent fuel remain unresolved. Amid a steady push globally for decarbonization and energy security, nuclear power has regained favor in places such as Europe. Yet in the aftermath of the meltdown at Tokyo Electric Power

Co. Holdings's Dai-ichi Fukushima nuclear plant in 2011, little progress has been made in restarting Japan's reactors.

Source: <https://asia.nikkei.com/Business/Energy/Japan-nuclear-research-set-to-revive-on-U.S.-fast-reactor-project>, 03 January 2022.

**URANIUM PRODUCTION**

**KAZAKHSTAN**

**Uranium Sector Monitors**  
**Evolving Kazakh Situation**

Protests that began in Atyrau and the wider Mangystau region have since 2 January spread to other cities across Kazakhstan including the

**The U.S., which has also not been fully engaged in fast reactor development, is said to have sought Japan's cooperation on the TerraPower project. Japan is well-positioned to convey lessons following a sodium coolant leak at Monju and to provide data from test operating the Joyo fast reactor.**

country's main city of Almaty. Some cities, including Almaty and Atyrau, have seen violent clashes between protestors and police with deaths, injuries and arrests reported. The Kazakh government has imposed a nationwide State of

Emergency and imposed a curfew. The internet has been blocked in large parts of the country... "The situation in Kazakhstan is dynamic and evolving".... The national protests and the security clampdown on transport, financial and

**The national protests and the security clampdown on transport, financial and communication systems may add to pre-existing operating risks such as the COVID-19 pandemic's impact on employees and contractors, as well as global supply chain disruptions to critical goods and services required for uranium production.**

communication systems may add to pre-existing operating risks such as the COVID-19 pandemic's impact on employees and contractors, as well as global supply chain disruptions to critical goods and services required for uranium production. We will have a better understanding of the

operating risks once we have had a chance to communicate with our JV partner Kazatomprom. "As 40% of the world's uranium supply, any disruption in Kazakhstan could of course be a significant catalyst in the uranium market. If nothing else, it's a reminder for utilities that an

over-reliance on any one source of supply is risky. It also reinforces the shift in risk from suppliers to utilities that has occurred in this market.”...

**Batyrbayev: No Problems:** Kazatomprom Chief Commercial Officer Askar Batyrbayev has said uranium deliveries will not be affected by the protests. ... “We are fulfilling all our obligations easily, there are no problems with uranium shipments and we will meet all delivery deadlines” .... French nuclear company Orano - which owns 51% of the KATCO joint venture with Kazatomprom - said its uranium mining operations in Kazakhstan were continuing “as they are in an isolated region away from areas hit by unrest” .... Kazakhstan has 12% of the world’s uranium resources and is the world’s largest producer. Kazatomprom - the national atomic company - controls all uranium exploration and mining as well as other nuclear-related activities, including imports and exports of nuclear materials....

Source: <https://www.world-nuclear-news.org/Articles/Uranium-sector-monitors-evolving-Kazakh-situation>, 07 January 2022.

**Some 15 large reactors of Russian design supply Ukraine with about 54% of its electricity. In recent months the country’s government has announced a new build programme in collaboration with the USA and the reactor vendor Westinghouse.**

## **UKRAINE**

### **Ukraine Pushes for Domestic Uranium Supply**

A programme to make Ukraine self-sufficient in uranium by 2027 has been approved by the country’s cabinet. Nuclear power is planned for significant expansion beyond the 54% of electricity it already provides in Ukraine.... The plan announced by the Ministry of Energy on 29 December lists several measures to maintain and boost uranium production. First, it would ensure the operation of the Smolinskaya mine until 2023 and the Ingulskaya mine until 2028. These have resources of around 66,000 tU and 5000 tU respectively....

Next would come development of new production facilities at Novokonstantinovskoye and Aprelskoye between 2023 and 2025, with their commissioning in 2026.... Pilot production at Novokonstantinovskoye took place in 2011 but the mine was never brought to full operation. To

support the expansion of mining, Ukraine will renovate the hydrometallurgical and sulphuric acid plants at the Stepnoye Mining and Processing Combine, where uranium is extracted from ore. Furthermore, Ukraine’s plans for self-sufficiency also cover materials needed to manufacture the fuel assemblies used in its power reactors. Domestic production of zirconium dioxide will be boosted to 320 tonnes per year...and it will “organise cooperation” so that Ukrainian zirconium is used for the metal cladding of fuel assemblies it purchases.

Some 15 large reactors of Russian design supply Ukraine with about 54% of its electricity. In recent months the country’s government has announced a new build programme in collaboration with the USA and the reactor vendor Westinghouse. The AP1000 reactor design is to be deployed at the Khmelnytsky nuclear power plant first, with four more units to follow at other existing nuclear power plants. Ukraine has also been discussing the deployment of NuScale’s VOYGR small reactors and the licensing work that would be involved.

Source: <https://www.world-nuclear-news.org/Articles/Ukraine-pushes-for-domestic-uranium-supply>, 05 January 2022.

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Iran Says Nuclear Agreement can be Reached if US Sanctions Lifted**

Iran’s foreign minister has said an agreement can be reached with world powers over its nuclear deal if Western parties have the will and intention to do so...As eighth round of negotiations aimed at restoring Iran’s landmark 2015 nuclear deal is under way in Vienna, where Iran is still looking for guarantees that US sanctions will be lifted. The talks over JCPOA are taking place between Iran and world powers that are signatories to the deal. The United States, which unilaterally withdrew from the deal in 2018, is participating

in the talks indirectly.

The JCPOA provided sanctions relief to Iran in exchange for curbs on its nuclear programme. But after the US withdrawal, Iran abandoned some curbs and is now using advanced centrifuges to enrich uranium up to 60 percent. Following its departure, the US reimposed crippling sanctions on Iran. Tehran is now demanding the complete lifting of US sanctions, as well as guarantees that the US will not pull out of the accord again, and calling to be given a period of time to verify sanctions are effectively lifted....

Source: <https://www.aljazeera.com/news/2022/1/6/iran-fm-says-vienna-deal-can-be-reached-if-us-sanctions-lifted>, 06 January 2022.

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## **NUCLEAR NON-PROLIFERATION**

### **GENERAL**

#### **Virus Delays U.N. Nuclear Treaty Meeting, Possibly till August**

A coronavirus surge has upended plans to hold a major nuclear treaty conference at the United Nations, with participants agreeing on December 30, 2021 to postpone the meeting just days before its scheduled start. After nearly two years of pandemic delays, delegations from around the world had been scheduled due to converge on U.N. headquarters on January 4 to take stock of the 1970 Non-Proliferation Treaty....

But organisers are now pencilling in an August 1 start date for the already long-delayed conference....

The treaty is the world's most widely ratified nuclear arms control agreement, with 191

participating countries. Nations without atomic weapons committed not to acquire them and to allow verification that nuclear energy programs weren't morphing into weaponry. Countries that had nuclear weapons when the treaty was signed — the United States, Russia, Britain, France and China — agreed to move toward eliminating them. Review conferences are scheduled every five years to assess implementation and try to

hash out new commitments, though participants sometimes have been unable to agree on any final declaration or plan. That happened at the last meeting, in 2015. The next gathering was initially scheduled for spring 2020 but has repeatedly been pushed back because of the pandemic.

As coronavirus cases spike again in the U.N.'s host city of New York and a growing number of staffers are sick or are quarantined...it couldn't accommodate a big gathering now. The organisation suggested moving the conference online or delaying it...Besides governments, arms control groups also have been keenly awaiting the conference at a time when issues range from the

frayed Iran nuclear deal to established atomic-armed powers' work to modernise their arsenals. "The further postponement of the NPT Review Conference is very unfortunate and should not be used as an excuse not to pursue actions necessary to curb the accelerating global nuclear arms race," said Daryl Kimball, the executive director of the

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Washington-based Arms

Control Association.  
Source: <https://www.thehindu.com/news/international/coronavirus-delays-un-nuclear-treaty-meeting-possibly-till-august-2022/article38079587.ece>, 31 December 2021.

INDIA

**India Hails Statement by 5 World Powers to Stop Nuclear Weapons**

India on January 7 welcomed a joint pledge by the US, the UK, China, Russia and France to prevent the spread of atomic weapons and reaffirmed its nuclear doctrine of maintaining a credible minimum deterrence based on a 'no first use' policy and commitment to universal nuclear disarmament. In a rare joint statement, the five key nuclear-armed nations on January 3 said that a nuclear war cannot be won and must never be fought while vowing to prevent the spread of atomic weapons.

Arindam Bagchi, the spokesperson in the MEA said that as a responsible nuclear weapon state, India has a doctrine of maintaining a credible minimum deterrence based on a 'no first use' posture and non-use of nuclear weapons against non-nuclear-weapon states. He said India remains committed to the goal of universal, non-discriminatory and verifiable nuclear disarmament. "We welcome the Joint Statement, which reaffirms the importance of addressing nuclear threats, and underscores the desire to work towards creating a security environment more conducive to progress on disarmament with the ultimate goal of a world without nuclear weapons with undiminished security for all."...

In the statement, the five world powers underlined their desire to work with all states to create a security environment conducive to progress on disarmament with the ultimate goal of a world without nuclear weapons with "undiminished" security for all. "We intend to continue seeking bilateral and multilateral diplomatic approaches to avoid military confrontations, strengthen stability and predictability, increase mutual understanding and

**The MEA said that as a responsible nuclear weapon state, India has a doctrine of maintaining a credible minimum deterrence based on a 'no first use' posture and non-use of nuclear weapons against non-nuclear-weapon states.**

**We intend to continue seeking bilateral and multilateral diplomatic approaches to avoid military confrontations, strengthen stability and predictability, increase mutual understanding and confidence, and prevent an arms race that would benefit none and endanger all".**

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In his comments, Bagchi said India's annual resolution at the UN General Assembly (UNGA) on 'Reducing Nuclear Danger' calls for steps to reduce the risk of unintentional or accidental use of nuclear weapons, including through "de-alerting and de-targeting" of nuclear weapons. "Our annual resolution on a 'Convention on the Prohibition of the use of Nuclear Weapons' seeks the commencement of negotiations in the Conference on Disarmament on an international convention prohibiting the use or threat of use of nuclear weapons under any circumstances" .... "Both resolutions are adopted with substantive support at the UNGA. India will continue to contribute further to the global nuclear disarmament and non-proliferation agenda" ....

Source: [https://www.business-standard.com/article/current-affairs/india-hails-statement-by-5-world-powers-to-stop-nuclear-weapons-122010701208\\_1.html](https://www.business-standard.com/article/current-affairs/india-hails-statement-by-5-world-powers-to-stop-nuclear-weapons-122010701208_1.html), 08 January 2022.

NUCLEAR SAFETY

GENERAL

**IAEA Releases First Guide Level Publication on Stakeholder Engagement in Nuclear Programmes**

To succeed, nuclear power and other nuclear projects need to engage with all relevant stakeholders, including the public. The IAEA has now released its first guide-level publication to support national efforts to engage with stakeholders throughout the life cycle of all nuclear facilities—from uranium mining and new and operating reactors to non-electric applications, radioactive waste management and decommissioning. Stakeholder Engagement in Nuclear Programmes (Nuclear Energy Series No. NG-G-5.1) provides theoretical



and practical guidance on developing and implementing stakeholder engagement programmes and activities. It is the latest in a series of IAEA initiatives to support countries in this area, including through the Agency's Milestones Approach for countries introducing nuclear power, technical meetings, webinars and other publications.

Stakeholders come in a variety of shapes and sizes. Some, such as regulators, are required by law to be involved in projects. Others include any individuals or groups who feel affected by an activity. In order to enhance confidence in the project and build trust, organizations are encouraged to develop and implement a stakeholder engagement programme, which can enable those individuals and groups to be involved and understand the basis for decisions.... Explaining nuclear energy, strengthening relationships and building trust with stakeholders is key to the successful implementation, operation and expansion of all nuclear facilities, including nuclear power plants. The new guide will assist communication experts, senior managers and other experts to establish and maintain a long-term stakeholder engagement strategy and activities for a nuclear programme. These experts work for key organizations involved in the nuclear project or facility, including government, owner/operator and regulator. Other employees who are involved in communication or engagement activities will also find the content of this guide useful and relevant to their work....

The publication identifies five key principles for effective engagement: building trust,

demonstrating accountability, exhibiting openness and transparency, practicing early and frequent consultation and communicating the benefits and risks of the nuclear technology.

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After providing an overview of the topic, the new guide covers the development of stakeholder engagement strategies and plans, including practical information such as stakeholder mapping. It then discusses the roles and responsibilities of key nuclear organizations and how the types of approaches and activities selected differ.

Finally, engagement approaches for the different life cycle stages are examined, showing how each stage requires its own strategic approach.

In December 2020, the IAEA organized two events on stakeholder engagement and public acceptance. The "19th INPRO Dialogue Forum on Enhancing Public Acceptance of Nuclear Energy through Institutional Innovations" and the webinar on "Engaging with Policy and Decision Makers: Knowledgeable and Interested Leaders" underscored how effective

**Stakeholder engagement is of particular interest to newcomer countries seeking to introduce a new nuclear power programme and is one of the 19 nuclear infrastructure issues that make up the IAEA's Milestones Approach, together with others such as nuclear safety and security, funding and financing and radioactive waste management.**

stakeholder engagement is needed to support nuclear energy in fulfilling its potential to help countries to mitigate climate change and achieve energy security and sustainable development.

Stakeholder engagement is of particular interest to newcomer countries seeking to introduce a new nuclear power programme and is one of the 19 nuclear infrastructure issues that make up the IAEA's Milestones Approach, together with others such as nuclear safety and security, funding and financing and radioactive waste management. There are currently around 30 such newcomers, with Bangladesh and Turkey already constructing

their first nuclear power plants....

Source: <https://www.iaea.org/newscenter/news/iaea-releases-first-guide-level-publication-on-stakeholder-engagement-in-nuclear-programmes>, 05 January 2022.

## NUCLEAR WASTE MANAGEMENT

### CANADA

#### NWMO Publishes Transportation Planning Documents

Canada's Nuclear Waste Management Organisation (NWMO) has released two planning documents that address the wide range of priorities, questions and concerns heard to date from Canadians and Indigenous peoples about the transportation of used nuclear fuel.... The used fuel will need to be moved from interim storage facilities near reactor sites across Canada to a proposed deep geological repository site. The transportation programme is expected to begin in the 2040s, once the repository is operational.

**The used fuel will need to be moved from interim storage facilities near reactor sites across Canada to a proposed deep geological repository site. The transportation programme is expected to begin in the 2040s, once the repository is operational.**

The *Transportation Planning Framework* sets out objectives, priorities, and considerations for transporting used nuclear fuel. It was informed by public feedback on an initial draft released in August 2020. Key updates include more discussion of the importance of Indigenous voices in the planning process and an acknowledgement that people have concerns about existing infrastructure gaps and impacts. In addition, the document reflects a need to continue to engage with the public to ensure it remains aligned with their priorities over the 20-year planning process. The *Preliminary Transportation Plan* provides an overview of the technical approaches, regulatory requirements and planning assumptions that the NWMO will build on to ensure safe and secure transportation that protects people and the

**NWMO plans to select a repository site in 2023. Ignace and South Bruce, both in Ontario, are being studied as possible host areas, having been narrowed down from a list of 21 interested communities through a process launched in 2010.**

environment. NWMO said transportation plans will continue to evolve and become more detailed over the next 20 years of planning.... NWMO's transportation approach will be subject to ongoing review and public reporting. Every three years, NWMO will review and revise the *Transportation Planning Framework*, which will consider updates based on factors such as evolving best practice, new technologies, and ongoing adaptation and continuous improvement. NWMO plans to select a repository site in 2023. Ignace and South Bruce, both in Ontario, are being studied as possible host areas, having been narrowed down from a list of 21 interested communities through a process launched in 2010. Detailed site characterisation, federal impact assessment and licensing processes will begin in 2024. A five-year strategic plan published by NWMO last year anticipates construction of the repository beginning in 2033, with operations beginning between 2040 and 2045.

Source: <https://world-nuclear-news.org/Articles/NWMO-publishes-transportation-planning-documents>, 10 January 2022.

### USA

#### US Close to Ending Buried Nuke Waste Clean-up at Idaho Site

A lengthy project to dig up and remove radioactive and hazardous waste buried for decades in unlined pits at a nuclear facility that sits atop a giant aquifer in eastern Idaho is nearly finished.... The US Department of Energy...removed the final amount of specifically-targeted buried waste from a 97-acre (39-hectare) landfill at its 890-square-mile (2,300-square-kilometer) site that includes the Idaho National Laboratory. The targeted radioactive waste included plutonium-

contaminated filters, graphite molds, sludges containing solvents and oxidized uranium generated during nuclear weapons production work at the Rocky Flats Plant in Colorado. Some radioactive and hazardous remains in the Idaho landfill that will receive an earthen cover.... The clean-up project, started in 2005, is named the Accelerated Retrieval

Project and is one of about a dozen clean-up efforts of nuclear waste finished or ongoing at the Energy Department site. The project involving the landfill is part of a 2008 agreement between the Energy Department and state officials that required the department to dig up and remove specific types and amounts of radioactive and hazardous material.... Most of the waste is being sent to the U.S. government's Waste Isolation Pilot Plant in New Mexico for permanent disposal. Some waste will be sent to other off-site repositories that could be commercial or Energy Department sites....

**Most of the waste is being sent to the U.S. government's Waste Isolation Pilot Plant in New Mexico for permanent disposal. Some waste will be sent to other off-site repositories that could be commercial or Energy Department sites.**

The Lake Erie-sized Eastern Snake River Plain Aquifer supplies farms and cities in the region....

The nuclear site started operating in the late 1940s under the Atomic Energy Commission, a forerunner to the Energy Department, and contamination of the aquifer began in 1952.... Contamination reached the aquifer through injection wells, unlined percolation

ponds, pits into which radioactive material from other states was dumped, and accidental spills mainly during the Cold War era before regulations to protect the environment were put in place. Tritium accounted for most of the radioactivity in water discharged into the aquifer...but also included strontium-90, cesium-137, iodine-129, plutonium isotopes, uranium isotopes, neptunium-237, americium-241, and technetium-99....

*Source: <https://www.theweek.in/wire-updates/international/2022/01/04/fgn19-us-nuclear-waste-cleanup.html>, 04 January 2022.*



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