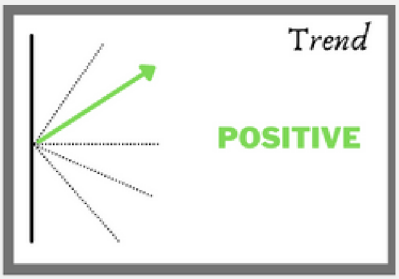
CAPS Nuclear Tracker

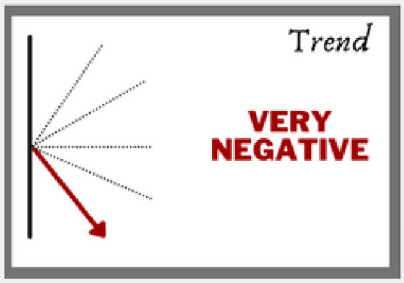
Issue X: October - December 2023

We are at the end of 2023, and our trendlines on the nuclear issues that NukeNerds at CAPS have regularly monitored through the year have largely remained similar. Nuclear energy has registered the most positive trend over the year. In fact, the recently concluded COP-28 seems to have given a fillip to this source of electricity as an important player in meeting national climate change commitments. Nuclear security, remains a concomitant concern and the issue has figured in national priorities and international efforts towards this end. Nuclear proliferation, on the other hand, of the vertical kind as evidenced in modernisation and expansion of arsenals in nuclear weapon states, and the horizontal kind as seen in the cases of North Korea and Iran reflected seriously negative trends. If it is any consolation, nuclear arms control that had fallen off our last issue of the nuclear tracker has come back once again owing to the US-China strategic dialogue in this quarter. It remains to be seen where this development goes in the coming months. We at CAPS wish you a very happy new year and promise to continue monitoring nuclear developments across the wide spectrum. Do write in to us with your thoughts and suggestions at capsnetdroff@gmail.com.

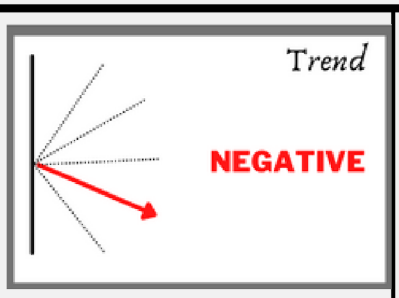
TREND OVERVIEW



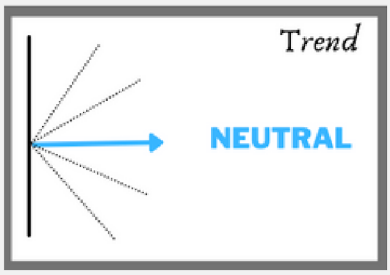
- **Nuclear Energy**
  Dr Dhruba Tara Singh
  Ms Rishika Singh
  Ms Ritika Maurya



- **Iran**
  Dr Silky Kaur



- **Missile Developments**
  Mr Javed Alam
  Mr Jay Desai
- **Vertical Nuclear Proliferation**
  Dr Manpreet Sethi
- **North Korea**
  Dr Silky Kaur
- **Nuclear Arms Control**
  Dr Silky Kaur

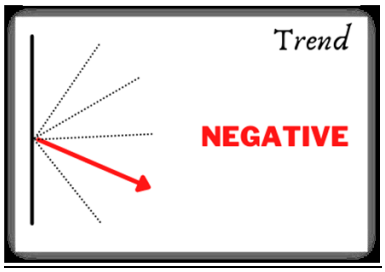


- **Sea-Based Nuclear Developments**
  Mr Javed Alam
- **Nuclear Security**
  Ms Prachi Lokhande
- **Nuclear Disarmament**
  Dr Manpreet Sethi

Missile Developments

Javed Alam & Jay Desai

Previous Trend: Negative



On October 5, 2023, while speaking at the annual meeting of the Valdai Discussion Club, Russian President Vladimir Putin claimed **Russia** successfully tested the ground-launched Burevestnik (RS-SSC-X-09 Skyfall) nuclear-powered, nuclear-armed cruise missile. The previous tests of Burevestnik were plagued by failures and a fatal accident in 2019 that claimed multiple lives. The precise time of the test and whether it succeeded is unknown. Although Putin said this was the 'final successful test' for Burevestnik, suggesting the missile has approached the end of its development cycle, experts suggest that this is unlikely because of the system's multiple prior failed tests and the highly experimental character of the system's propulsion unit. Experts are also of the view that Russia has exaggerated the progress of other missile programmes, such as the RS-28 Sarmat (RS-SS-X-29) intercontinental ballistic missile, and so such statements should be treated cautiously. On November 10, 2023 it was reported that the **Russian** military successfully test-launched an ICBM designed to carry nuclear warheads from a new nuclear submarine. The Russian Defense Ministry said in a statement that Emperor Alexander III's strategic missile cruiser fired the Bulava missile from an underwater position in Russia's northern White Sea and hit a target in the far-eastern region of Kamchatka. The Emperor Alexander III is one of the new Borei-class nuclear submarines that carry 16 Bulava missiles each and are intended to serve as the core naval component of the nation's nuclear forces in the coming decades. According to the Defense Ministry, launching a ballistic missile is the final test for the vessel, after which a decision should be made on its induction into the fleet.

On October 7, 2023 it was reported that the **US** Navy had tested its Trident II D5 missile. On October 16, 2023 it was reported that the US Army had successfully tested a futuristic missile defence radar**.** On November 3, 2023 it was reported that a recent failed Minuteman III test has led to new concerns about the age of America's land-based nuclear arsenal. An unarmed Minuteman III missile had been terminated during a test launch from Vandenberg Space Force Base, California due to an anomaly on November 1, 2023. The upcoming Sentinel missiles, which U.S. officials say will be easier to maintain and upgrade, are to replace the 400 Minuteman IIIs in the continental U.S. The

Pentagon is accelerating the Sentinel tasks to meet the operational goal by September 2030 as part of the nation's modernization of all three components of nuclear forces—air, land, and sea.

Meanwhile, on October 19, 2023, the US Department of Defence released an updated annual **China** Military Power Report. The report noted that China's military continues to expand its global reach, building up strategic and tactical capabilities, especially its missile programme. It says the People's Liberation Army is developing air-to-air missiles that can strike from beyond visual range, conventionally armed intercontinental missile systems and increased numbers of nuclear warheads. While the 2021 edition of the China Military Power Report cited the PL-15 missile, a beyond-visual-range munition often compared to the U.S AIM-120 AMRAAM, the update did not. However, unconfirmed reports indicate the Chinese are working on a more advanced long-range missile, sometimes called PL-XX or PL-21. The new DOD report seems to reference this development, noting that China is "exploring dual-mode guidance capabilities, which uses both active radar and infrared homing seekers that improve target-selection capabilities and make the missiles more resistant to countermeasures." On October 23, 2023, reports surfaced that **China** has developed a new surface material for hypersonic vehicles that can remain intact after a long flight. In a test conducted by the Chinese military, the thin material was applied to the surface of a "waverider" aircraft – which uses shock waves generated by its own flight to improve lift. The air around the hypersonic aircraft was then heated to thousands of degrees Celsius.

On October 21, 2023, it was reported that **Pakistan** had test-fired an Ababeel missile capable of carrying multiple warheads that can attack different targets. Pakistan last tested the MIRVed missile on Jan. 24, 2017. The ISPR stated that the test was meant to revalidate "various design, technical parameters, and performance evaluation of different sub-systems" and was "aimed at strengthening deterrence and enhancing strategic stability in the region." A few days later, on October 24, 2023, it was reported that Pakistan had launched a Ghauri missile as a readiness test.

On November 7, 2023 it was reported that **India** had successfully test-fired its surface-to-surface SRBM 'Pralay' from the Abdul Kalam Island off the Odisha coast. Pralay is a 350-500 km short-range, surface-to-surface missile with a payload capacity of 500-1,000 kg. The solid-fuel, battlefield missile is based on the Prithvi Defence Vehicle. On November 21, 2023 **India** successfully conducted the second trial of its indigenous naval anti-ship missile. The test was a collaborative effort between the Defence Research and Development Organisation (DRDO) and the Indian Navy. The missile integrates various advanced technologies, featuring an indigenous launcher for the helicopter and a guidance system comprising cutting-edge navigation and integrated avionics. On December 7, 2023 it was reported that **India** successfully conducted the training launch of the SRBM Agni-1 from APJ Abdul Kalam Island off the Odisha coast. Agni-1 is a proven, high-precision missile system. The user training launch, carried out under the aegis of the Strategic Forces Command, "successfully validated

all operational and technical parameters," said the official, on basis of data obtained by many tracking systems, including radar, telemetry and electro-optical systems.

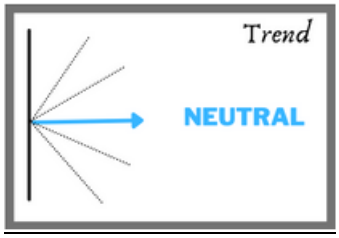
On November 11 and 14, 2023 **North Korea** successfully conducted static tests of a new solid-fuel engine for its IRBM. The country "has developed new-type high-thrust solid-fuel engines for IRBM again, which are of important strategic significance," the official Korean Central News Agency (KCNA) reported. North Korea has carried out a slew of weapons tests in recent years, including its first solid-fuel ICBM and a "new type" of SLBM, as leader Kim Jong Un steps up efforts to modernise the country's military.

On November 19, 2023 the **French** Defence Ministry said that it successfully tested M51.3 long range ballistic missile which boosted the nuclear deterrence of France.

Sea-Based Nuclear Developments

Javed Alam

Previous Trend: Negative



In June 2023, **US** Republican lawmakers adopted an amendment to the 2024 National Defense Authorization Act to develop a sea-launched nuclear cruise missile and, on October 3, 2023, included funding in appropriations legislation for the Department of Energy. As per the legislation, the Administration strongly opposes continued funding for the W80-4 Alteration-Sea-Launched Cruise Missile-Nuclear (SLCM-N) program. The President's 2022 Nuclear Posture Review concluded that SLCM-N, which would not be delivered before the 2030s, has marginal utility and would impede investment in other priorities. In addition, deploying SLCM-N on Navy attack submarines or surface combatants would reduce the capacity for conventional strike munitions, create additional burdens on naval training, maintenance, and operations, and could create additional risks to the Navy's ability to operate in key regions in support of U.S. deterrence and warfighting objectives. The U.S. has sufficient current and planned capabilities for deterring an adversary's limited nuclear use through conventional and nuclear armaments, including the W76-2 low-yield SLBM warhead, the current air-launched cruise missile, its successor (the long-range standoff weapon), and F-35A dual-capable aircraft that can be equipped with B61-12 nuclear gravity bombs. Further investment in SLCM-N would divert resources and focus from higher modernization priorities for the U.S. nuclear enterprise and infrastructure.

On October 24, 2023, it was reported that **China** had launched its first nuclear-powered guided missile submarines. The Pentagon's report titled 'Military and Security Developments Involving the People's Republic of China' marks the first apparent confirmation that modified submarines seen in Chinese shipyards over the last 18 months are Type 093B guided missile submarines. The report notes that three of the new SSGNs could be operational by next year as part of a wider expansion of its submarine fleet - both nuclear and diesel-powered - which could number 65 vessels in 2025.

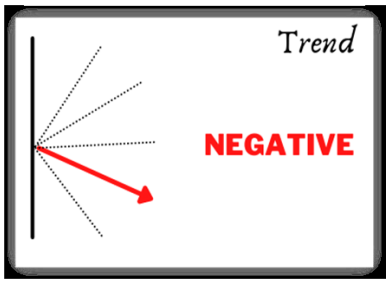
In other news, it was reported by Russian state media that **Russian** Navy has received two nuclear-powered submarines and a diesel-electric boat on November 28, 2023, with two more undersea platforms also scheduled to join the service soon. Tass reported the Navy received the Varshavyanka-class submarine Mozhaysk on November 28. Two days later, the service received two nuclear-

powered boats, the Borei-A-class Emperor Alexander III and the Yasen-M-class Krasnoyarsk, the state news agency RIA Novosti reported. The Emperor Alexander III is part of Russia's new Borei (Arctic Wind) class of SSBNs, each of them armed with 16 nuclear-tipped Bulava ICBM. The Borei is the first new generation of undersea vessels Russia has launched since the Cold War. The Krasnoyarsk belongs to the Yasen (Ash Tree) class of multi-purpose submarines equipped with long-range, high-precision missiles that Putin said could strike targets at sea and on land. The two submarines are due to join Russia's Pacific fleet. President Putin travelled to the northern city of Severodvinsk to view the vessels, Emperor Alexander III and Krasnoyarsk, at the Sevmash shipbuilding yard where they were built over the past six years. "With such ships and such weapons, Russia will feel that it is safe," Putin told officials and naval officers at the ceremony.

Vertical Nuclear Proliferation

Manpreet Sethi

Previous Trend: Negative



Deployment of nuclear weapons by Russia to Belarus was debated in First Committee (Disarmament and International Security) on October 5, 2023. The move, amid the war in Ukraine, was decried for raising dangers of escalation and impacting regional and global security.

On Oct 6, 2023, President Putin, in an announcement to "mirror the manner of the US", which has signed but not ratified the CTBT, made a call for de-ratification of the treaty by Russia as well. On Nov 2, 2023, president Putin signed the revocation of Russian ratification of the CTBT after it was approved by the Duma. Meanwhile in October, Russia's Interfax news agency accused the US of conducting tests at Nevada test site to "validate new predictive explosion models" in violation of the CTBT. US, however, described these tests as attempts to develop new technology in support of US nuclear non-proliferation goals.

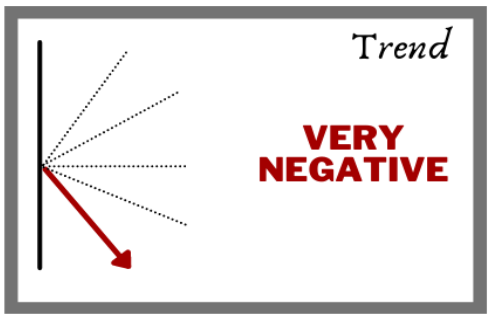
Reports have surfaced that in the remote desert where China detonated its first atom bomb nearly 60 years ago, a drilling rig has bored a deep vertical shaft that goes down at least a third of a mile. It is being seen as evidence of Beijing considering the test of a new generation of a nuclear weapon that could increase the lethality of its rapidly expanding missile force.

In November 2023, it was reported by state Russian television that Russia's rocket forces have loaded an ICBM equipped with the nuclear-capable Avangard hypersonic glide vehicle into a launch silo in southern Russia. This missile can manoeuvre sharply after detaching from the rocket and move at hypersonic speeds of up to 27 times the speed of sound (about 34,000 kms per hour). Later, on Dec 19, 2023, President Putin said Russia has modernized its entire strategic nuclear arsenal. The proportion of modern weaponry in its nuclear forces this year "has been brought to 95% and in the naval component almost 100%," he said.

Iran

Silky Kaur

Previous Trend: Negative



In September, USA and Iran concluded a prisoner exchange for release of $6 billion of Iranian oil funds in South Korea, aiming to ease tensions and potentially pave the way for further nuclear talks. However, the conflict between Israel and Hamas thwarted hopes for progress in de-escalation. In November 2023, the IAEA reported that Iran continued barring inspectors and hinder the agency's work. IAEA also stated that Iran's "estimated stockpile of enriched uranium had reached more than 22 times the limit set out in 2015 accord… it's now enriched to up to 60 percent purity, close to weapons-grade, for three atom bombs".

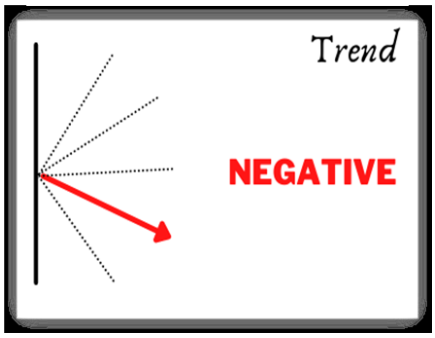
On November 30, 2023, the IAEA DG urged global powers to resume talks with Iran, emphasizing the need to address the risks associated with Iran's accumulation of enriched uranium. Grossi stressed the importance of re-establishing a dialogue system with Iran despite the current focus on the Israel-Hamas conflict because neglecting Iran's nuclear ambitions could exacerbate the issue. Tensions between Iran and the West have intensified following the October 7 attack by Hamas on Israel. Iran supports Hamas and various anti-Israel and anti-West militant groups in the region.

On December 18, 2023, the Chief of the UN's political affairs told the Security Council that despite calls to all parties to prevent Iran from acquiring nuclear weapons, "diplomatic endeavours continue to be at a standstill."

North Korea

Silky Kaur

Previous Trend: Negative



In October 2023, the military forces of South Korea, the United States, and Japan carried out their joint aerial exercise as a response to the escalating nuclear threats posed by North Korea. The exercise also featured the participation of a U.S. B-52 bomber capable of carrying nuclear weapons. North Korea criticized the deployment of the U.S. aircraft carrier battle group to South Korea, deeming it a provocative act. North Korea also restated its relationship with Russia and denounced the condemnation by the United States and its allies regarding alleged arms deliveries to Russia as biased and misrepresented. Choe Son Hui, the Foreign Minister of North Korea, emphasized that the ties between Pyongyang and Moscow serve as a strategic factor.

In November 2023, the United States and South Korea updated their bilateral security agreement to address the evolving nuclear and missile threats from North Korea. On November 15, 2023, North Korea successfully tested newly developed solid-fuel engines intended for intermediate-range ballistic missiles. This test is part of North Korea's efforts to develop more potent and less detectable weaponry capable of targeting U.S. military bases in Guam and Japan.

On November 27, 2023, the United States accused North Korea of launching a prohibited military spy satellite. U.S. official stated that "the DPRK is unabashedly trying to advance its nuclear weapons delivery systems by testing ballistic missile technology in clear violation of this council's resolutions." North Korean government claimed that it has launched the spy satellite, which has sent back "detailed" photographs of the White House, the Pentagon, and U.S. nuclear aircraft.

On December 9, 2023, the national security advisers of the United States, South Korea, and Japan called for a stronger international push to suppress North Korea's development of nuclear weapons and missiles, its cybertheft activities, and alleged arms transfers to Russia. On December 16, the U.S. reiterated its intense warning to North Korea over nuclear threats.

On December 17, 2023, North Korea fired a short-range ballistic missile and followed it up the next day with another ICBM launched with a potential range of 15,000 km into the East Sea. U.S. described this launch as a "flagrant violation of multiple U.N. Security Council resolutions". On December 21, 2023, according to the IAEA, North Korea reportedly initiated the operation of a light-water reactor at its primary nuclear facility, raising concerns about producing materials for nuclear weapons. IAEA warned the country may be producing plutonium, an element that can be used to make nuclear weapons—potentially violating U.N. sanctions.

Nuclear Energy

Rishika Singh, Ritika Maurya, & Ngangom Dhruba Tara Singh

Previous Trend: Positive

The last quarter of 2023 witnessed an overwhelming commitment to increase of nuclear energy by many countries. 24 countries signed up to the goal of tripling global nuclear energy capacity by 2050 at the UN's COP28 climate change conference. The heads of state, or senior officials, from Bulgaria, Canada, the Czech Republic, Finland, France, Ghana, Hungary, Japan, South Korea, Moldova, Mongolia, Morocco, the Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, Ukraine, the UAE, the UK and the US signed the declaration at the conference in Dubai. The IAEA opened Atoms4Climate pavilion at COP28.

In Europe, the **European Council** adopted its position on the proposed Net-Zero Industry Act (NZIA), which is intended to bolster Europe's manufacturing output in technologies needed for decarbonization. Nuclear power has been included in the list of "strategic" technologies. **Poland** issued decisions-in-principle for the construction of power plants based on GE Hitachi Nuclear Energy's BWRX-300 small modular reactor (SMR) at six locations, and a total of 24 BWRX-300 reactors are planned at the sites. The **UK** Atomic Energy Authority (UKAEA) has awarded ten contracts worth a total of USD 14.6 million to nine organisations to develop their innovative technologies for fusion energy.

In North America, the **US** announced seven regional clean hydrogen hubs that will share US$ 7 billion in federal funding to accelerate the commercial-scale deployment of low-cost, clean hydrogen options and nuclear energy features in them, including a large nuclear-powered clean hydrogen production facility in Illinois. Holtec International said that it would commission its first two units of SMR-300 the Michigan site by 2030, while it expects to restart the existing shutdown pressurised water reactor unit at the site by the end of 2025.

During the World Climate Action Summit, COP28, the **US** government announced the first international strategy for commercializing nuclear fusion to support the timely development, demonstration, and deployment of commercial fusion energy in strategic areas like research and development and harmonization of regulatory frameworks. In order to help achieve net-zero targets, the **US** Department of State and US Export-Import Bank (EXIM) have established a set of financial mechanisms to encourage the implementation of advanced nuclear energy systems including SMRs during the COP28 meeting. Large investments in group enrichment and conversion capacity spanning Canada, Japan, France, and the UK—known as the Sapporo 5—were included in the announcement.**Canada** announced US$ 15 million in federal funding to support the phase-out of coal-fired electricity generation by 2030, and for the pre-development work for a small modular reactor in New Brunswick.

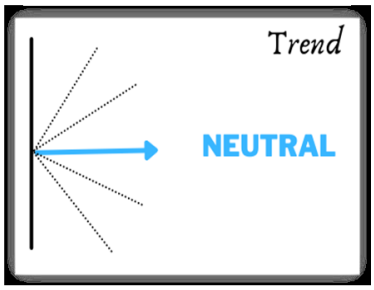
In Asia, **China's** first project to bring nuclear-generated heat to multiple prefecture-level cities began operation in Shandong province, supplying heat from the Haiyang nuclear power plant to the cities of Haiyang and Rushan through a 23 km pipeline. Beijing announced that the world's first modular high-temperature gas-cooled reactor nuclear power plant has entered commercial operation in Shidao Bay. Unit 2 of the Shin Hanul nuclear power plant in **South Korea** attained a sustained chain reaction for the first time, the unit is the second of two APR-1400 reactors at the site. In **Russia**, fresh nuclear fuel was loaded into the starboard side reactor on the Akademik Lomonosov in the first operation of its kind, with the process due to be completed by December. **Turkey**'s Nuclear Regulatory Agency (NDK) issued permission to the Akkuyu nuclear power plant to commission the first power unit. On December 6, 2023, **India** said that it is working on the development of small nuclear reactors (SMRs). This initiative aims to accelerate the country's efforts to achieve its clean energy goal of 500 GW by 2030. On the sidelines of the United Nations' COP28, for the Barakah nuclear power station in the United Arab Emirates, **Kazakhstan**'s Kazatomprom and the **United Arab Emirates** Nuclear Energy Corporation (ENEC) inked the first commercial uranium fuel supply agreement.

In the last week of November this year, the **UK** and **Korea** partnered for cooperation on energy security and clean energy transition. This partnership sets out to strengthen cooperation on their shared interests and ambitions across the clean energy transition, low carbon technologies and domestic climate policies, and civil nuclear energy.

Nuclear Security

Prachi Lokhande

Previous Trend: Neutral



On September 29, 2023, the Moroccan Agency for Nuclear and Radiological Safety and Security (AMSSNuR) and the IAEA signed in Vienna Practical Arrangements aimed at strengthening radiological safety measures in Africa. The signing ceremony took place on the sidelines of the 67th regular session of the IAEA's General Conference.

On October 3 2023, IAEA opened a nuclear security training centre to support the growing efforts to tackle global nuclear terrorism. The centre will provide more than 2000 square meters of specialized technical infrastructure and equipment for course participants to learn about the physical protection of nuclear and other radioactive material, as well as detection and response to criminal acts involving nuclear material and facilities.

IAEA and UN Office on Drugs and Crime organised a side event at the 67th IAEA General Conference in Oct 2023 to promote the universalization and effective implementation of the A/CPPNM and ICSANT. The former enhances the security of nuclear material, reducing the risk of its falling into the wrong hands; the latter ensures that those who attempt to use such material for malicious purposes are prosecuted and held accountable. Both are legally binding undertakings and together they create a robust framework to address the range of challenges from physical protection to legal prosecution.

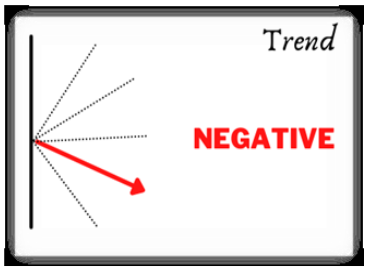
Former head of Afghanistan's national security service expressed concerns about Taliban exploring avenues to acquire tactical nuclear weapons. He made the remarks at the Herat security conference on Nov 27, 2023. Experts at the conference voiced scepticism about the Taliban having the capabilities, connections or motivation to acquire such a weapon, but Mr Nabil said the possibility was too dangerous to ignore.

According to a statement by IAEA DG on the situation in Ukraine dated December 15, 2023, Ukraine's Zaporizhzhya Nuclear Power Plant (ZNPP) has been re-connected to its only remaining back-up power line. The site's overall supply of off-site electricity remains fragile and vulnerable to disruptions. During the military conflict, frequent power cuts have remained a source of serious concern for safety and security at Zaporizhzhya as it needs electricity to cool its reactors and for other essential functions, even if all units have been shut down. Earlier in December, the ZNPP suffered its eighth complete loss of external electricity in less than 18 months, caused by grid events outside the plant itself.

Nuclear Arms Control

Silky Kaur

Previous Trend: Negative



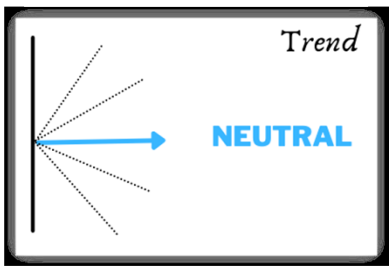
On November 2, 2023, President Vladimir Putin took a significant step by signing a law that revokes Russia's ratification of the Comprehensive Test Ban Treaty (CTBT). This treaty has been crucial in restraining nuclear testing for the past 27 years. The decision signals a deterioration in relations between Russia and the United States, particularly in the context of Russia's military actions in Ukraine. Moreover, this move contributes to the broader trend of the international arms control framework facing increased challenges and instability.

In a notable development, China and the United States initiated long-anticipated talks on nuclear arms control on November 6, 2023. This meeting represents the first of its kind in nearly five years. Although the meeting in Washington did not produce specific results, and there was no announcement of a precise date for subsequent talks, U.S. officials underscored the significance of the conversation in light of increasing nuclear and geopolitical tensions. In subsequent statements released shortly after the meeting, both the Chinese Foreign Ministry and the U.S. State Department characterized the talks as candid, comprehensive, and constructive.

Nuclear Disarmament

Manpreet Sethi

Previous Trend: Neutral



States-parties to the Treaty on the Prohibition of Nuclear Weapons (TPNW) held their second meeting in New York from 27 Nov to 01 Dec, 2023. 92 countries participated in the meeting as states parties or observers. They engaged in a robust and interactive debate during the week, adopting a political declaration and package of decisions. One of the adopted decisions included, for the first time ever, an agreement to work together to challenge the false narratives of nuclear deterrence. New research was presented during the meeting, including greater understanding of the cascading effects of detonations on food supplies, the financial system and energy supplies. Additionally, the Scientific Advisory Group presented research findings showing that elimination of nuclear weapon facilities is possible and that there are ways to achieve conversion of facilities to civilian use, ways to develop processes for arms control, such as weapon counting and warhead authentication. A new UN study on the consequences of nuclear war was called for given that the last comprehensive studies were done in the late 1980s.

During the week, more than 65 events, including art exhibitions, concerts, panel discussions, awards ceremonies and more were held on the margins of the meeting. The Third Meeting of States Parties to the treaty will take place 3-7 March, 2025 in New York.

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Centre for Air Power Studies (CAPS) was established in 2001 as an autonomous defence research and analysis body for research and focused analyses on issues related to national security, defence, and aerospace issues in the evolving strategic and international security environment. Its objective is to facilitate a greater understanding of these issues amongst the Armed Forces, the strategic community, and the public besides contributing to policy generation and decision-making.

CAPS research faculty comprises senior retired and serving Armed Forces officers from the three services besides academic scholars from national universities and retired members from the diplomatic community. CAPS also conducts nuclear strategy capsules for the Armed Forces and officers of security and technological organisations.