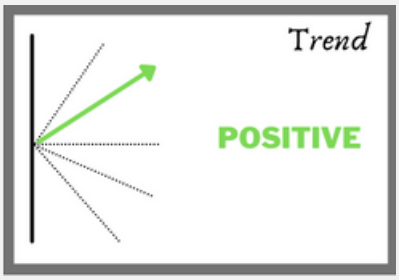
CAPSS Nuclear Tracker

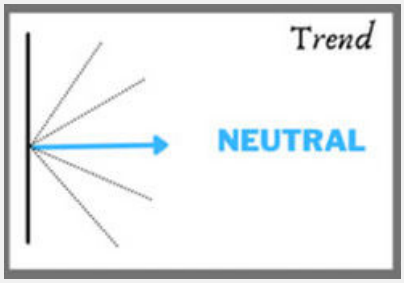
Issue 18 : October-December 2025

As the year comes to an end, developments in the nuclear landscape suggest a negative trend in most areas. Concerns grew throughout the year regarding missile advancements, vertical proliferation dynamics, nuclear security risks, and regional flashpoints, including Iran and the Korean Peninsula. Nuclear energy is the only area to have shown a consistently positive trend, while nuclear non-proliferation is now neutral amid some cautious diplomatic engagements. As the international community moves into 2026, it will mark the 80th anniversary of the first resolution adopted by the United Nations General Assembly in 1946, which created the U.N. Atomic Energy Commission and charged it with making proposals for "the elimination from national armaments of atomic weapons" and the use of atomic energy only for peaceful purposes. The year will also host important NPT and TPNW Review Conferences. Our team will continue to track developments in this space . We sign off with best wishes for the new year.

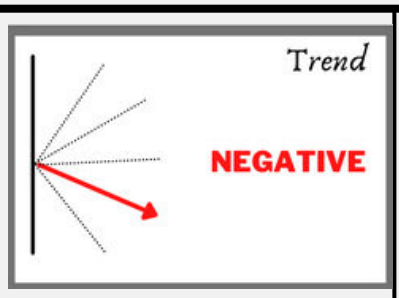
TREND OVERVIEW



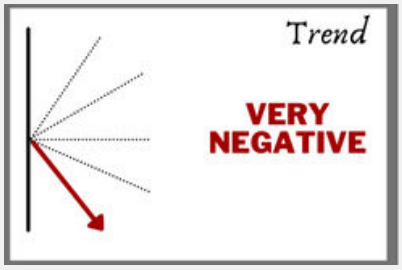
- **Nuclear Energy**
  Ms Sanaa Alvira



- **Nuclear Non-Proliferation**
  Dr Manpreet Sethi



- **Missile Developments**
  Dr Javed Alam
- **Vertical Nuclear Proliferation**
  Dr Javed Alam
  Mr Prahlad Kumar Singh
- **North Korea**
  Dr Manpreet Sethi
- **Nuclear Security**
  Ms Sanaa Alvira

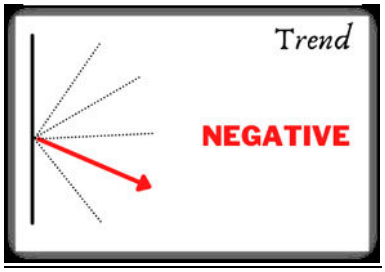


- **Iran**
  Dr Manpreet Sethi

Missile Developments

Javed Alam

Previous Trend: Negative



The last quarter of 2025 saw several new missile developments. **Russia**, within the span of eight days in October, conducted two significant tests of its novel nuclear-weapon delivery vehicles. On October 21, 2025, Russia conducted a successful test flight of the *Burevestnik* (NATO: RS-SSC-X-09 Skyfall). Burevestnik is a nuclear-powered cruise missile. According to the statement of the Chief of General Staff Valery Gerasimov, the missile was in the air for 15 hours. A Russian military journal quoted in the IISS report claims the missile has a range of between 10,000 and 20,000km, allowing "the missile to be based anywhere in Russia and still be able to reach targets in the continental US." Almost a week after the Burevestnik test, Russia tested the *Poseidon* (NATO: Kanyon) intercontinental-range nuclear-powered unmanned underwater vehicle (UUV). Russia's President Vladimir Putin stated that the Poseidon had been launched for the first time from a submarine using a conventional motor, after which the torpedo transitioned to nuclear propulsion. Poseidon is meant to be deployed on the *Belgorod*, a modified Oscar II-class nuclear-powered submarine which was declared operational in 2022. More recently, on November 01 2025, the nuclear-powered submarine specifically designed to carry Poseidon, the *Khabarovsk*, was rolled out at the Sevmash shipyard in Severodvinsk. Unlike Belgorod, which is thought to have a hybrid role, the Khabarovsk appears to have been optimised more narrowly for a Poseidon-carrier role and is reportedly capable of carrying six units. Further down the line, Russia, while conducting a regular exercise of its strategic forces, also test-launched a Yars ICBM from a mobile launcher on October 22, 2025. During the same exercise, Russia also launched a Sineva SLBM from a submarine and launched ALCMs from Tu-95MS bombers. On October 28, 2025, Russia conducted another test of its Sarmat ICBM. However, the test was deemed a failure as at about 7 seconds into the flight, the first stage engine visibly failed, the missile began to tumble, and caught fire shortly afterwards.

On the Korean Peninsula, **North Korea** continued its trend of testing missiles. On October 22, 2025, North Korea tested a new class of tactical ballistic missile, which appears to use a terminal stage hypersonic glide vehicle. The KCNA report did not disclose the weapon system that was tested, but it is likely the Hwasong-11E short-range ballistic missile (SRBM), which was unveiled in North Korea's military parade on October 10 and shown carrying hypersonic glide vehicles. The Hwasong 11-E is the latest iteration of North Korea's Hwasong-11 family of SRBMs. The system is still under development. North Korea further fired at least one ballistic missile on November 07, 2025, just days after the U.S. Defence Secretary Pete Hegseth visited South Korea for annual security talks. Following that, on October 28, a test launch of multiple sea-to-surface cruise missiles in the Yellow Sea was conducted. The launches occurred from a recently commissioned warship off the country's west coast. The test highlighted Pyongyang's enhanced naval attack capabilities prior to the APEC summit. The Missile Administration of North Korea reported that the missiles, adapted for vertical launch from vessels, followed the predetermined trajectory for over 7,800 seconds prior to impacting their targets.

The **US**A also conducted a readiness test of its ICBM. On November 5, 2025, the U.S. Air Force Global Strike Command conducted a test launch of an unarmed Minuteman III ICBM. The test, designated GT 254, evaluated the ongoing reliability, operational readiness, and accuracy of the ICBM system.

In early November, CNN reported that **China** had significantly expanded its missile-related infrastructure since 2020. The investigation revealed that over 60 per cent of 136 facilities associated with missile production or the People's Liberation Army Rocket Force (PLARF) exhibited signs of expansion. These locations encompass manufacturing plants, research laboratories, and testing facilities. From early 2020 to late 2025, the facilities expanded by over 21 million square feet (exceeding 2 million square meters) of new construction. Satellite imagery reveals newly constructed towers, bunkers, and defensive earthworks indicative of weapons development. In certain instances, missile components are visible.

On September 25, **India**'s DRDO, in collaboration with the Strategic Forces Command (SFC), carried out the successful launch of the intermediate-range Agni-Prime missile from a rail-based mobile launcher system, under a full operational scenario. This next-generation missile is designed to cover a range of up to 2000 km and is equipped with various advanced

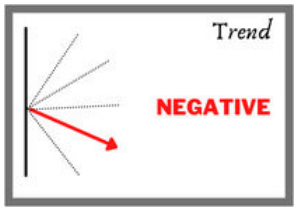
features. The first-of-its-kind launch was carried out from a specially designed rail-based mobile launcher having the capability to move on the Rail network without any preconditions. It provides for cross-country mobility and can launch within a short reaction time with reduced visibility. It is self-sustained and is equipped with all independent launch capability features, including the state-of-the-art communication systems and protection mechanisms. On December 25, 2025, India tested the K-4 missiles from its SSBN, INS Arighat. Derived from the Agni-III land-launched missile, this 3500 km range missile is India's longest-range sea-launched strategic weapon. It has the ability to pop out of a submarine launch silo, bubble up to the ocean surface, and then activate its rocket motor to blast into the air.

On November 26, 2025, **Pakistan** test-fired an indigenously developed ship-launched anti-ship ballistic missile, the SMASH Ship-Launched Anti-Ship Ballistic Missile. According to a statement issued by the Inter-Services Public Relations (ISPR), the test was conducted "from a locally produced naval platform, enhancing the country's defence capabilities." "The missile is capable of striking both sea and land targets with high accuracy," the ISPR said, adding that it is equipped with advanced guidance technology and enhanced manoeuvrability features.

Vertical Nuclear Proliferation

Javed Alam & Prahlad Kumar Singh

Previous Trends: Negative



On October 20 2025, the **UK** Ministry of Defence confirmed that Project Astraea, the United Kingdom's next-generation nuclear weapon initiative, is entirely financed by a £15 billion government investment scheme. The Astraea A21 warhead is designed to replace the Mk4A Holbrook now utilised on Trident II D5 missiles. It will be installed on the Royal Navy's Dreadnought-class submarines upon their operational deployment in the 2030s. The programme, developed by the Atomic Weapons Establishment, is featured in the Strategic Defence Review 2025.

On October 29, 2025, Donald Trump announced that the **USA** would resume nuclear weapon testing after a thirty-three-year moratorium. The announcement was made just hours before the meeting with Xi Jinping in South Korea. He posted, "Because of other countries' testing programs, I have instructed the Department of War to start testing our nuclear weapons on an equal basis. That process will begin immediately". Later, while speaking to a TV channel, he also claimed that Russia, China, North Korea and Pakistan are conducting nuclear tests.

In response, Russian President Vladimir Putin ordered officials to consider the proposal of possible Russian nuclear tests. He said **Russia** would take "appropriate retaliatory steps" if the U.S. proceeded. Russian Defence Minister Andrei Belousov also called for immediate preparation for full-scale nuclear testing, citing the U.S. "Active build-up of strategic weapons". He also said that the test could be carried out at Novaya Zemlya in northern Russia "within a short timeframe"

While in Southern Asia, the officials in **Pakistan** responded that "[it] will not be the first to resume nuclear tests." Pakistan's last known nuclear explosive test was in 1998, and since then its government says it has observed a "unilateral moratorium on nuclear testing," despite not being a signatory to the international Comprehensive Test Ban Treaty (CTBT).

India also commented on the U.S. President's remarks and on November 07 2025, India's Ministry of External Affairs stated that "clandestine and illegal nuclear activities are in keeping with Pakistan's history. India has always drawn the attention of the international community to these aspects of Pakistan's record."

On November 27, 2025, **China** released its White Paper on arms control, disarmament, and non-proliferation. The paper reiterated China's enduring no-first-use policy and its nuclear strategy centred on self-defence. However, it provided little clarification regarding the scale of its current strategic military expansion. The white paper claims that, in pursuit of a "lean and effective" deterrent, China is boosting its strategic early-warning systems, command and control capabilities, missile penetration and rapid-response capacity, along with the overall survivability of its nuclear forces.

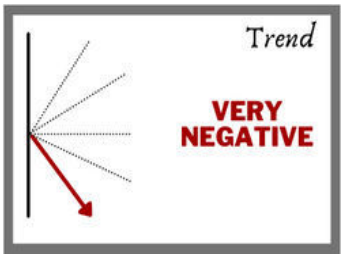
The **USA**, on December 04, 2025, also published its 2025 National Security Strategy (NSS). The NSS, unlike its predecessors, had very little content related to nuclear proliferation. The NSS asserted that "We want the world's most robust, credible, and modern nuclear deterrent, plus next-generation missile defences—including a Golden Dome for the American homeland—to protect the American people, American assets overseas, and American allies".

In December, **India's** Navy Chief, Admiral Dinesh K. Tripathi, announced that INS Aridhaman, the country's third indigenously built nuclear-powered ballistic missile submarine, is nearing completion of sea trials and will be commissioned soon. At the annual pre-Navy Day press conference, he said that the submarine will boost India's sea-based nuclear deterrent, particularly through its ability to carry longer-range missiles and better survivability at sea in accordance with India's nuclear doctrine. The revelation came ahead of the Navy Day celebrations in Thiruvananthapuram. After the commissioning of INS Arighaat in August 2024, INS Aridhaman represents further development in India's indigenous nuclear submarine programme.

Iran

Manpreet Sethi

Previous trend: Very negative



On October 18, 2025, Iran announced the official termination of the Joint Comprehensive Plan of Action (JCPOA)—the landmark 2015 nuclear agreement—citing the expiration of U.N. Security Council Resolution 2231 and longstanding disagreements with Western partners. Tehran stressed its commitment to diplomacy but stated that all provisions and restrictions under the JCPOA no longer apply after a decade.

On October 20, 2025, Iran announced that it had cancelled a cooperation agreement with the International Atomic Energy Agency (IAEA) intended to resume inspections of Iranian nuclear sites. On November 05 2025, the IAEA said Iran must "seriously improve" cooperation with IAEA inspectors to avoid escalating tensions. In mid-November 2025, Iranian officials acknowledged that IAEA inspectors conducted visits to some nuclear sites, but Iranian authorities simultaneously criticised the agency for allegedly endorsing attacks on its facilities earlier in the year.

On November 16 2025, Iran's Foreign Minister Abbas Araghchi stated that Tehran had stopped uranium enrichment at all declared nuclear facilities, acknowledging the impact of Israeli and U.S. strikes earlier in the year. Araghchi emphasised that Iran's nuclear activities were under IAEA monitoring and denied any undeclared enrichment efforts, positioning the announcement as a gesture toward diplomatic engagement despite rising tensions and snapback sanctions.

On November 20 2025, the IAEA's Board of Governors passed a resolution urging Iran to immediately provide comprehensive information and rapid access to its enriched uranium stockpile and damaged nuclear facilities. The resolution stressed that Iran must cooperate fully

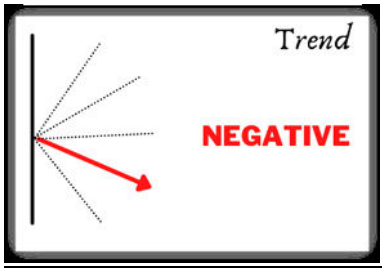
to rebuild confidence and credibility about the peaceful nature of its nuclear program, highlighting that inspectors remain restricted from key locations impacted by earlier conflicts.

On December 23, 2025, the U.S. and Iran exchanged sharp criticisms at the U.N. Security Council over reviving nuclear talks. The U.S. emphasised readiness for direct negotiations and condemned Iran's non-cooperation with IAEA inspections, while Iran rejected "zero enrichment" demands as contrary to NPT rights and insisted on fair, balanced proposals. The year appears to have ended with not too much clarity on the real impact of the attacks on nuclear facilities on Iran's capability and intention to pursue nuclear weapons ambitions. Meanwhile, there is an evident loss of IAEA oversight.

North Korea

Manpreet Sethi

Previous trend: Negative



On October 10, North Korea held a major military parade marking the 80th anniversary of the Workers' Party, showcasing the new Hwasong-20 ICBM, described by state media as the country's "most powerful nuclear strategic weapon system." On October 21-22, North Korea conducted short-range ballistic missile launches, the first since May, simulating nuclear counterstrikes. State media emphasised these as demonstrations of readiness against perceived threats from U.S.-South Korea exercises.

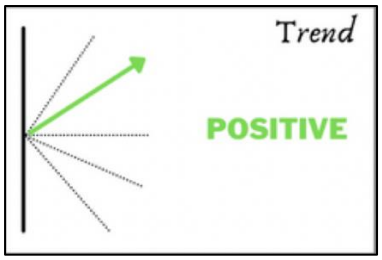
The announcement of South Korea's emerging plans, backed by the United States, to build nuclear-powered submarines was sharply criticised by Pyongyang, and it warned that such a move would trigger a "nuclear domino" effect in the region. On November 30, 2025, North Korean state media reported leader Kim Jong Un commemorating the Air Force's 80th anniversary, emphasising its role in nuclear war deterrence. Kim highlighted military hardware, including mobile missile launchers, reinforcing the narrative that North Korea's air and strategic forces were key pillars of its nuclear deterrent.

On December 20, 2025, North Korea criticised Japan's perceived moves toward reconsidering its non-nuclear stance, demanding that Japan's nuclear weapons ambitions be "thoroughly curbed." On December 25, 2025, it was reported that North Korea released images of a nearly completed 8,700-ton nuclear-powered submarine hull, signalling progress in naval nuclear capability development. Leader Kim Jong Un inspected the construction site and oversaw the test-firing of a long-range surface-to-air missile, which reportedly hit targets at 200 km — part of strategic weapons advancement. Kim also used the occasion to yet again denounce the U.S.-South Korea nuclear submarine deal as an "offensive act" and threatened to accelerate North Korea's own nuclear weaponisation and naval power.

Nuclear Energy

Sanaa Alvira

Previous trend: Positive



The final months of the year have seen nuclear energy trends move in a broadly positive direction. Interest in nuclear power continues to grow across regions, supported by new legislative initiatives and renewed policy attention to nuclear energy's role in energy security and decarbonisation. Concerns about financing and fuel availability do not seem to have dampened the excitement surrounding the peaceful atom, and it is likely that interest in this area will continue to grow in the year ahead.

A significant indication of this momentum emerged from developing economies, where a new Rockefeller Foundation report outlined the potential for nuclear energy, including small modular reactors (SMRs), to account for up to 30% of electricity generation in several fast-growing markets by 2050. The analysis focused on countries such as India, Brazil, Nigeria, Indonesia and South Africa, and found that nuclear power could significantly reduce overall system costs when paired with renewables while providing a stable electricity supply. Released just weeks after COP30 in Brazil, the report pointed to the catalytic role that philanthropy could play in supporting regulatory readiness and public engagement.

India has taken a decisive legislative step by passing the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Bill 2025. This new legislation repeals and consolidates the 1962 Atomic Energy Act and the 2010 Civil Liability for Nuclear Damage Act, thereby modernising India's nuclear legal framework and enabling limited private sector participation under regulatory oversight. The bill also grants statutory recognition to the Atomic Energy Regulatory Board and introduces a graded liability framework. These reforms are closely tied to India's ambition to reach 100 GWe of nuclear capacity by 2047, complementing the government's broader Nuclear Energy Mission, which includes plans both for large reactors as well as Bharat Small Modular Reactors.

In Europe, **Italy** moved further toward reintroducing nuclear power after decades of phase-out. Italy operated four nuclear power plants from the early 1960s, but following the 1986 Chernobyl accident, the country held a referendum and decided to phase out nuclear power. The Italian Council of Ministers approved a draft bill delegating authority to the government to regulate the return of "sustainable" nuclear energy within the country's decarbonisation and energy security strategy. The proposed framework includes the development of a National Programme for Sustainable Nuclear Power, the establishment of an independent Nuclear Safety Authority, and the strengthening of scientific and industrial research, among other things.

In Southeast Asia, **Singapore** continued to build institutional and technical capabilities as it "seriously studies" the potential deployment of nuclear energy. While no decision has been taken to introduce nuclear power, government assessments have highlighted land constraints and limited renewable options as drivers for considering advanced reactor technologies. IAEA DG Grossi publicly noted Singapore's preparedness and institutional maturity, suggesting it could become a regional, "most perfect" example of stable, low-carbon nuclear deployment if it moves forward.

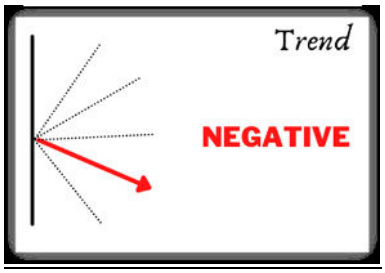
Regional and bilateral cooperation also featured prominently. **Slovenia** and **France** signed a declaration of intent to establish long-term cooperation in nuclear energy, as Slovenia evaluates options for a second unit at the Krško nuclear power plant. French utility EDF is among the potential suppliers, alongside Westinghouse. Similarly, during Russian President Vladimir Putin's visit to New Delhi in early December, the **Russian** government approved the signing of a Memorandum of Understanding with **India** to expand bilateral cooperation in civil nuclear energy. Rosatom, which is already constructing reactors at the Kudankulam nuclear power plant, has been authorised to deepen its collaboration with India's nuclear programme under the agreement.

Meanwhile, the **United States** and **Saudi Arabia** have reached an initial milestone in their negotiations on a civil nuclear cooperation framework. A joint declaration marked the sharing nuclear technology, which could pave the way for U.S. companies to participate in constructing reactors in the Kingdom. Although a formal 123 Agreement has yet to be signed, U.S. officials emphasised their commitment to non-proliferation and bilateral safeguards. However, it was not made clear whether the deal would include the "gold standard", which would prevent Saudi Arabia from engaging in enriching and reprocessing activities.

Nuclear Security

Sanaa Alvira

Previous trend: Negative



As the year comes to a close, trends in the nuclear security field continue to reflect a negative trajectory. While vulnerabilities in conflict zones have been a persistent concern in recent years, issues such as cybersecurity and confidentiality have re-emerged. Although some regional cooperation initiatives are positive and reassuring developments, they remain insufficient to offset the broader deterioration observed during the quarter.

The conflict in **Ukraine** remains a central driver of nuclear security risk. In early November, drone and missile attacks targeted electrical substations supplying the Khmelnytskyy and Rivne nuclear power plants, resulting in civilian casualties and widespread energy disruption. Ukrainian officials characterised the strikes as intentional efforts by Russia to endanger nuclear safety. In a December statement, IAEA Director General Rafael Grossi confirmed that the condition of Ukraine's electrical grid had reached its worst state since monitoring began in 2024, with multiple substations critical to nuclear safety affected by military activity. DG Grossi emphasised that the degradation of off-site power supplies continues to undermine one of the IAEA's Seven Indispensable Pillars for nuclear safety and security during armed conflict.

Beyond active conflict, cyber and information security vulnerabilities have become increasingly prominent. In **Russia**, a reported cyber breach at state-owned Radon, a nuclear waste management plant operated by Rosatom, allegedly resulted in the theft of testing data and user information. Although the full scope of the breach has yet to be verified independently, the incident raises concerns about the potential nuclear security consequences of compromising a plant's digital systems. Given Radon's involvement in handling, storing and monitoring

radioactive waste, unauthorised access could allow for the manipulation of testing records or deeper intrusion into systems responsible for radiation monitoring and waste management.

Similar concerns emerged in **Japan**, where the Nuclear Regulation Authority disclosed a mishandling of confidential documents related to nuclear material protection at Tokyo Electric Power Company's (TEPCO) Kashiwazaki-Kariwa nuclear power plant in Niigata. This lapse occurred while the world's largest plant awaited approval from the Governor to restart operations. In two separate incidents, a subcontractor was mistakenly handed confidential nuclear security documents, and tools were brought into the plant without following the correct procedures.

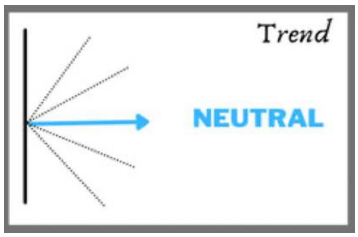
Concerns about protecting sensitive nuclear information were also evident in the **United States**. The head of the National Nuclear Security Administration issued an unusually forceful directive warning against the leakage of classified and sensitive information across the nuclear weapons complex. This intervention is indicative of the ongoing challenges associated with managing such a large-scale, contractor-driven nuclear enterprise.

Longstanding proliferation anxieties regarding **Pakistan** resurfaced during the quarter with the release of declassified transcripts of private discussions between U.S. President George W Bush and Russian President Vladimir Putin during an Oval Office meeting in September 2005. The documents revealed shared concern over Pakistani-origin nuclear material appearing in Iran's enrichment programme and lingering doubts about Islamabad's control over its nuclear assets, even years after the exposure of the AQ Khan network. President Putin reportedly highlighted the dangers of nuclear weapons in regimes without any democratic accountability, while President Bush emphasised the need to prevent the further spread of such technology. The two Presidents shared concerns over Pakistan's role in illicit transfers and ongoing cooperation between Pakistan and foreign nuclear programmes.

Limited positive developments were observed in **Southeast Asia**, where a large-scale IAEA-supported multilateral exercise tested cross-border cooperation to track, detect and recover smuggled radioactive sources in a realistic training environment. The MITSATOM exercise brought together Indonesia, Malaysia, Singapore, and Thailand to strengthen nuclear security across land and maritime borders.

Nuclear Non-proliferation

Manpreet Sethi



In preparation towards the forthcoming NPT RevCon in April 2026, **Vietnam,** as the chair of the Conference, held the first informal meeting with member states in October to discuss "preliminary priorities, orientations and consultation processes." The objective is to restore consensus and reinforce the NPT amid an unpredictable international security environment.

On November 17, 2025, **France** reiterated its support for the establishment of a Middle East Zone of Free of Nuclear Weapons and Other Weapons of Mass Destruction. It stated that "The establishment of a zone free of weapons of mass destruction will contribute to peace and stability in the region, which is a priority for France." It also linked this to the establishment of a nuclear-weapon-free zone in the Middle East also contributes to the “achievement of the objectives of the Non-Proliferation Treaty. France reiterates its full support for this Treaty, which remains the cornerstone of the international non-proliferation regime, and remains committed to working with all States parties to ensure the success of the next review conference in May 2026."

The **Italian Parliament** rejected a Resolution on Nuclear Disarmament proposed by a member, Laura Boldrini. The resolution proposed recognising the growing instability of the current global environment and promoted fundamental international norms as enshrined in the TPNW and NPT. The government's rejection of the resolution carried an explicit reference for the first time to Italy's participation in NATO's nuclear deterrence missions through dual capability assets, thus confirming the nuclear sharing arrangement.

On November 27, 2025, **China** released its White Paper on *China's Arms Control, Disarmament, and Non-proliferation in the New Era*. It reiterated China's efforts at promoting global stability, including through maintaining its no-first-use policy, a nuclear strategy of self-defence and participation in all international non-proliferation arrangements. The paper, however, provides no clarity on China's nuclear expansion and claims that the country is in pursuit of a "lean and effective" deterrent.

Disclaimer: The views and opinions expressed in this document are those of the authors and do not necessarily reflect the position of the Centre for Aerospace Power and Strategic Studies [CAPSS].

Centre for Aerospace Power and Strategic Studies (CAPSS) 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.

CAPSS 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. CAPSS also conducts nuclear strategy capsules for the Armed Forces and officers of security and technological organisations.