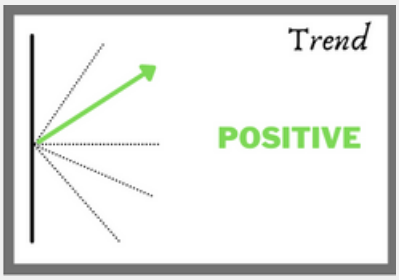
CAPS Nuclear Tracker

Issue 14: October - December 2024

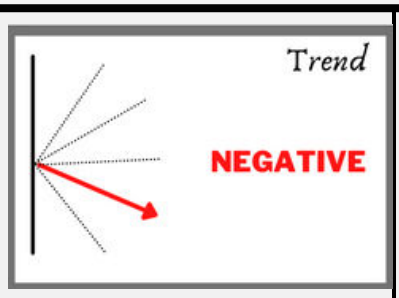
Speaking at the UNGA in September this year, UN Secretary General Guterres drew attention to the "dark shadow" over the world as it edged "towards the unimaginable". He was referring to the state of nuclear affairs which saw an unprecedented level of nuclear posturing as inter-state relations remained uncomfortably cold. This *Nuclear Tracker* that captures the mood from the developments of the last quarter of 2024 corroborates the UNSG's sentiment. Nuclear issues reflecting negative trendlines have only increased this year; nuclear security and nuclear disarmament remain on the fragile edge of neutral; nuclear energy, alone, has consistently retained a positive mood.

We hope that the new year will take more nuclear issues into the positive zone. Hope keeps the NukeNerds going. We wish you all a happy and peaceful 2025.

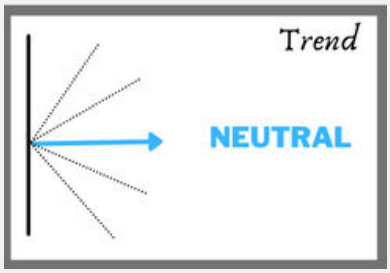
TREND OVERVIEW



- **Nuclear Energy**
  Dr Dhruba Tara Singh
  Ms Sanaa Alvira
  Ms Rishika Singh



- **Missile Developments**
  Mr Javed Alam
- **Vertical Nuclear Proliferation**
  Mr Javed Alam
  Mr Prahlad Kumar Singh
- **North Korea**
  Dr Silky Kaur
- **Iran**
  Dr Silky Kaur

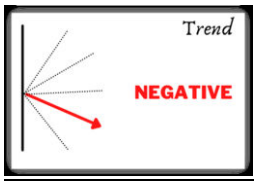


- **Nuclear Security**
  Ms Sanaa Alvira
- **Nuclear Disarmament**
  Dr Manpreet Sethi

Missile Developments

Javed Alam

Previous Trend: Negative



In the ongoing Russia-Ukraine war, the use of missiles for both strategic gain and political signalling has been evident. Russia has used large inventories of missiles during the war and various military exercises. On October 29, 2024, it was reported that **Russia,** while conducting a regular military exercise involving its strategic forces, launched a Yars ICBM from a mobile launcher in Plesetsk. The Yars missile is equipped with MIRV capabilities and has a range of 11000 km. During the same exercise, Russia launched a 12000 km range Sineva missile, a MIRVed SLBM from a Project 667BDRM/Delta IV class submarine from the Barents Sea. Russia also included the launch of a Bulava missile from the Knyaz Oleg submarine of the Project 955A/Borey-A class deployed in the Sea of Okhotsk. The Bulava is a submarine-launched ballistic missile with MIRV capabilities and has a range of 8300 km.

In the Korean Peninsula, missile launches continued in the last quarter of 2024. On November 1, 2024, **North Korea** test-launched its new solid-fuel ICBM, Hwasong-19. North Korea said the launch flew higher than any previous North Korean missile. North Korea also, on November 5, 2024, fired at least seven short-range ballistic missiles (SRBM), apparently in response to military drills conducted by the US, Japan and South Korea. In response to the growing missile threats from North Korea, South Korea, on November 8, 2024, tested an SRBM named the Hyunmoo-2B. The Hyunmoo-2A is powered by solid fuel and is a part of South Korea's kill chain preemptive strike and Korea's massive punishment and retaliation retaliatory strategy. The Hyunmoo-2B has a maximum range of 300 km.

In the last quarter of 2024, South Asia also witnessed tests of new missiles. **India,** on November 18, 2024, flight-tested a long-range hypersonic missile. The new hypersonic missile is a road-mobile missile with a range of 1500 km. To further boost its nuclear triad and the most critical leg of second-strike capability, India, on November 28, 2024, tested its nuclear-capable K-4 SLBM. The K-4 has a range of around 3,500 km and is a solid-fueled missile. Pakistan, on the other also tested an indigenously developed ship-launched ballistic

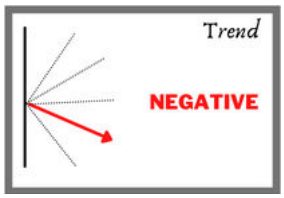
missile (SLBM) on November 4, 2024. The SLBM has a range of 350 km. The missile is named as SMASH/P282.

The **USA** has also tested two precision strike missiles to further improve its precision strike capabilities. On November 18, 2024, it was reported that the USA had conducted a flight test of the Precision Strike Missile (PrSM) Increment 1 capability. The PrSM Inc 1 will eventually replace the Army Tactical Missile System to provide greater range and lethality. The USA Field Artillery Regiment again launched two PrSM Inc 1 on December 12, 2024. The USA conducted another important test under the hypersonic realm on December 12, 2024. In collaboration with the US Navy Strategic Systems Programmes, the US Army's Rapid Capabilities and Critical Technologies Office completed the end-to-end flight test of the Common Hypersonic Glide Body. This was the first live-fire event for the Long-Range Hypersonic Weapon system. The missile is named Dark Eagle, an IRBM category missile with HGV capabilities.

Vertical Nuclear Proliferation

Javed Alam and Prahlad Kumar Singh

Previous Trend: Negative



On October 17, 2024, the **United States** Congressional Research Service published its updated In Focus report on the LGM-35A Sentinel ICBM. According to the report, the US Air Force plans to procure 634 Sentinel missiles and an additional 25 missiles to support development and testing. The report also highlighted that the Sentinel will be initially mated with the W87-0 nuclear warheads currently mounted on the Minuteman III. However, the W87-1 warhead will eventually replace the W87-0 warhead. In other news, the US Department of Energy's National Nuclear Security Administration has now verified the completion of the First Production Unit of a plutonium pit for the W87-1 Modification Programme.

On November, 12, 2024, Bulletin of the Atomic Scientist released a report on "United Kingdom Nuclear Weapon,2024". According to this report, the stockpile of **United Kingdom** nuclear warheads is increasing. The UK has had around 225 nuclear warheads for a long time, with up to 120 of them available for delivery by four Vanguard-class nuclear-powered ballistic missile submarines. Now, the UK is building new submarines and creating a new type of nuclear warhead. In the future, the UK is expected to have even more nuclear weapons, and a U.S. airbase in the UK will likely start handling nuclear missions again.

As security concerns increase, the **United States and the United Kingdom** are stepping up their nuclear cooperation. Before it expires at the end of the year, they intend to extend their defence agreement indefinitely. Their close defence partnership depends on this agreement, which is unique among nuclear-armed nations due to its high degree of collaboration and technology sharing. The extension will facilitate the exchange of nuclear components and materials for submarine reactors and weapons between the two nations.

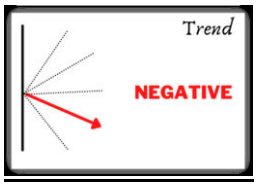
On December 18, 2024 US Department of Defense (DoD) released much-awaited annual report on "Military and Security Developments Involving the People's Republic of China". The report estimated that **China** possessed more than 600 nuclear warheads as of mid-2024, an increase of 100 warheads compared to 2023 and about 400 more since 2019. Besides mentioning the increase in ICBMs and their launchers, the report also highlighted that China, with its six SSBNs, is now conducting at-sea deterrent patrols. The report also claims that China will use its fast breeder reactor and reprocessing facilities for producing plutonium for nuclear weapons.

Four organisations in **Pakistan**, including a state-run defence agency, have been sanctioned by the U.S. for their role in the country's long-range missile program. According to U.S. State Department spokeswoman Mathew Miller, the restrictions are intended to prevent the spread of weapons of mass destruction and their delivery systems. The Islamabad-based National Development Complex (NDC) is one of the organisations that has been sanctioned. NDC largely developed the Shaheen-series missiles and other ballistic missile technology developed in Pakistan.

Iran

Silky Kaur

Previous Trend: Negative



In early November, Kamal Kharrazi, adviser to Iran's Supreme Leader Khamenei, stated that Iran possesses the technological capacity to develop nuclear weapons. He indicated that Tehran might revise its nuclear policy if faced with existential threats and suggested the possibility of extending the range of the country's ballistic missiles. On November 2, 2024, Khamenei issued a stern warning to the United States and Israel, threatening a "tooth-breaking response" after Israeli airstrikes targeted Iranian military facilities.

On November 14, 2024, Rafael Mariano Grossi, IAEA DG visited two critical sites—the Natanz nuclear facility and the Fordow enrichment plant, located approximately 100 kilometers south of Tehran. The visit highlighted mounting concerns as Iran continued enriching uranium to 60% purity, close to weapons-grade levels. In a joint press conference with Mohammad Eslami, head of Iran's Atomic Energy Organization, Grossi emphasized the diminishing window for diplomacy and the urgent need for "concrete and visible results" to ease tensions and avert conflict.

Meanwhile, international concerns grew following Israeli Prime Minister Benjamin Netanyahu's November 19 confirmation that Israel had carried out airstrikes on a nuclear-related facility at Iran's Parchin military complex. The strikes, reportedly targeting a site linked to nuclear weapons research, followed Iran's launch of nearly 200 ballistic missiles at Israel in October. While Tehran downplayed the damage, satellite imagery revealed significant destruction at the site.

On November 24, Iran announced plans for nuclear talks with France, Germany, and the United Kingdom, aimed at addressing its nuclear activities and other regional issues. This announcement followed an IAEA resolution condemning Iran for a lack of cooperation. President-elect Donald Trump's transition team, on December 13, reportedly explored options for preventive airstrikes on Iran to halt its nuclear ambitions. Trump also discussed a "maximum pressure 2.0" strategy, combining harsher sanctions with military support for

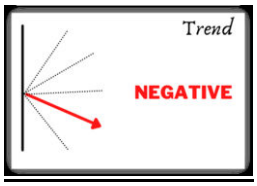
Israel. On Saturday, December 14, 2024, Iran confirmed it has allowed the IAEA to increase inspections at its nuclear facilities, including the Fordow enrichment plant.

December 15, 2024, Israeli officials suggested that the fall of Syrian President Bashar al-Assad's regime had created a strategic opening to target Iran's nuclear facilities. This possibility, coupled with U.S. support, is driving discussions of a potential decisive strike against Iran's nuclear program.

North Korea

Silky Kaur

Previous Trend: Negative



On October 4, 2024, North Korean leader Kim Jong Un warned that any threat to his country's sovereignty would trigger a nuclear response. The remarks followed South Korean President Yoon Suk Yeol's Armed Forces Day speech, where he vowed that any nuclear attack by Pyongyang would mean "the end of the North Korean regime." Just days later, on October 8, 2024, Kim Jong Un announced North Korea's growing nuclear ambitions during his visit to the National Defense University in Pyongyang. Kim criticized South Korean President Yoon Suk Yeol for aligning with the United States, accusing Seoul of regional destabilization.

On October 31, 2024, North Korea test-fired an intercontinental ballistic missile (ICBM) capable of reaching the U.S., marking the first such launch in nearly a year. The launch drew condemnation from the U.S., South Korea, and Japan, calling it a destabilizing act and underscoring growing military ties between North Korea and Russia.

President Kim continued to ramp up his rhetoric in November. On November 15, 2024, during a conference with army officials, he reiterated his commitment to the "limitless" expansion of North Korea's nuclear arsenal, citing escalating threats from the U.S. He criticized U.S. nuclear deterrence strategies with South Korea and its military cooperation with Japan, calling the latter an "Asian NATO." Kim also condemned U.S. support for Ukraine in its conflict with Russia, accusing Washington of using Ukraine as a tool to extend its military influence.

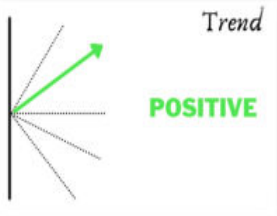
Moreover, on November 4, 2024, North Korea's UN envoy, Kim Song, announced at a United Nations Security Council meeting that Pyongyang would accelerate its nuclear weapons program in response to growing threats from "hostile nuclear weapons states," particularly the U.S. This announcement followed the ICBM test and underscored North Korea's desire to bolster its nuclear deterrent. Kim Song criticized U.S. actions, claiming that the nuclear threat from the U.S. had reached a "critical point" and was pushing the region

toward the brink of war. Meanwhile, the U.S. accused China and Russia of shielding North Korea from greater scrutiny at the UN, enabling the country to continue advancing its missile and nuclear programs.

Nuclear Energy

Ngangom Dhruba Tara Singh, Sanaa Alvira, Rishika Singh

Previous Trend: Positive



Nuclear energy is seeing a global increase as countries pursue greener and more reliable energy alternatives. Countries across Asia, Europe, and Africa are investing in nuclear power initiatives to address increasing energy demands and mitigate carbon emissions. India, Russia, Indonesia, and Bangladesh are at the forefront in Asia, whilst European countries such as Romania, Sweden, the United Kingdom, and Finland are diligently advancing nuclear expansion. Jamaica is undertaking initiatives to investigate the possibilities of nuclear technology in Africa.

In Asia, **India's** NTPC intends to establish a nuclear project in Bihar, thereby increasing its non-fossil energy portfolio. It has solicited the state government for a land lot at an appropriate location to advance its nuclear initiatives. In **Russia**, the sole functioning floating nuclear power plant (FNPP) has produced 978 million kWh of electricity over five years, sufficiently fulfilling the energy requirements of Chukotka, Russia, for over a year. The FNPP is a significant contributor to the region's energy composition, with nuclear power constituting 88 percent, as it prepares to compensate for the decommissioning of the Bilibino Nuclear Power Plant in 2025. **Indonesia** has declared plans to build a minimum of 20 nuclear power reactors as part of its initiative for net-zero emissions by 2050, with the initial project anticipated to be granted to the US nuclear developer ThorCon. The facility will be situated on Kelasa Island in Bangka Belitung province and is scheduled to produce a prototype reactor by 2028. The reactor assembly for the first unit at the Rooppur nuclear power station in **Bangladesh** has been completed. The Rooppur facility, located 160 km from the capital Dhaka, comprises two Russian VVER-1200 reactors. In February 2011, Rosatom secured a deal to construct two reactors at Rooppur for the Bangladesh Atomic Energy Commission.

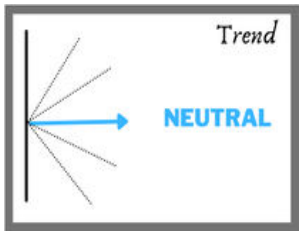
In Europe, Korea Hydro & Nuclear Power Co. (KHNP) finalised an agreement with **Romania**'s Societatea Nationala Nuclearelectrica (SNN) to renovate a nuclear reactor, signifying South Korea's entry into the nuclear plant refurbishing sector. Prime Minister Ulf Kristersson stated that **Sweden** will commence construction of a new NPP before the next legislative election in 2026. In November 2023, the government announced its objective to augment nuclear power generation by the equivalent of two reactors by 2035, with a substantial expansion anticipated by 2045. The **United Kingdom** and **Finland** have signed a Memorandum of Understanding to strengthen collaboration in civil nuclear energy, with the objective of attaining net-zero targets. The agreement emphasises the strategic significance of nuclear energy for enhancing energy security, cost-effectiveness, and sustainability. In **France**, on December 21, 2024, France integrated the Flamanville 3 nuclear reactor into its grid, according to state-operated EDF, marking the first expansion of the nation's nuclear power infrastructure in 25 years. The reactor, which commenced operations in September prior to grid connection, is becoming operational 12 years later than initially scheduled.

In Africa, on October 22, 2024, Prime Minister Andrew Holness of **Jamaica** describes the signing of a Memorandum of Understanding with Atomic Energy of Canada Limited and Canadian Nuclear Laboratories Limited for the promotion of nuclear technology adoption as a crucial milestone in Jamaica's energy transformation. In Latin America, on December 20, 2024, **Argentina**'s President Javier Milei pledged to put nuclear reactors to supply electricity for artificial intelligence servers, which require substantial energy consumption. Argentina operates three nuclear power plants: Atucha I, Atucha II, and Embalse. As of July, nine percent of the country's energy consumption was derived from nuclear sources, according to government statistics.

Nuclear Security

Sanaa Alvira

Previous Trend: Neutral



A drone severely damaged a clearly marked IAEA vehicle during a team rotation at the Zaporizhzhya Nuclear Power Plant (ZNPP) on 10 December. DG Grossi condemned the incident as an "unacceptable" attack on IAEA staff who were on their way to meet the IAEA team at the ZNPP to conclude their month-long rotation. The armoured vehicle, carrying a driver and a security officer, was hit 8 kms from the front line in Ukrainian-controlled territory. Although both were unharmed, the rear of the vehicle was destroyed. In his opening statement to the Board of Governors, DG Grossi did not indicate who was responsible for the attack, stating that the drone used to attack the IAEA convoy was a so-called "loitering munition", which is designed to explode on impact. As a result, there was no visible debris that could be recovered from the site to help identify the perpetrators. DG Grossi said: "I have said in the past that attacking a nuclear power plant is a no go. Attacking those who care for the nuclear safety and security of these plants is also absolutely unacceptable." Both Russia and Ukraine blamed each other for the attack.

In his latest statement on the situation in Ukraine, DG Grossi said that operating nuclear reactors continue to face disruptions due to attacks on the country's energy infrastructure. On 13 December, five of the country's nine operating reactors reduced electricity output due to military attacks and disruptions to the electricity grid, while two others were already operating below nominal capacity due to damage from earlier attacks in November. While there were no reports of direct damage to the plants, an IAEA team was reportedly forced to take cover and heard explosions in the distance. DG Grossi stated, “Our teams deployed in Ukraine have witnessed how the growing instability of Ukraine’s power infrastructure, as a result of frequent military attacks in recent months, is impacting the ability to safely operate the country’s nuclear power plants.”

There have also been some positive developments. On 3 December 2024, Seychelles deposited its instrument of ratification of the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) with the UN Secretary-General, becoming the 126th State Party to the Convention with effect from 2 January, 2025. This development strengthens international efforts to combat illicit acts involving nuclear or other radioactive materials. Seychelles' accession underscores the universal relevance of ICSANT, demonstrating that no country, regardless of its size, geographical location or nuclear infrastructure, is immune to such risks. ICSANT is an important tool for effectively preventing and responding to acts of nuclear terrorism and requires all States to establish sustainable legal frameworks to address this threat.

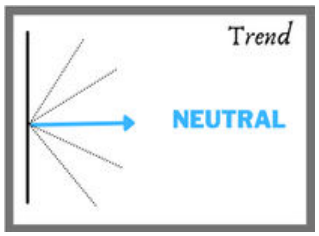
From 2 to 13 December, Romania hosted an International Physical Protection Advisory Service (IPPAS) mission conducted by a ten-member IAEA team. The mission reviewed Romania's nuclear security regime, including physical protection and computer security at nuclear facilities and during the transport of nuclear material. The mission, hosted by the National Commission for Nuclear Activities Control (CNCAN), aims to assist Romania in further aligning its nuclear security measures with international standards. The team commended Romania for its comprehensive efforts to improve its nuclear security regime and for the effective cooperation between the various competent authorities in the field of nuclear security. The team also acknowledged the improved nuclear safety measures at Romanian installations.

An IAEA review team has commended Ghana's progress in nuclear and radiation safety as the country moves forward with plans to develop a nuclear power programme. The team noted Ghana's commitment to regulatory improvements and stressed the importance of maintaining the independence of the Nuclear Regulatory Authority (NRA) in safety-related decision-making. The IAEA's Integrated Regulatory Review Service (IRRS) assists countries in strengthening their regulatory infrastructure for nuclear, radiation, radioactive waste and transport safety.

Nuclear Disarmament

Manpreet Sethi

Previous Trend: Neutral



While all the nuclear armed states remain steadfast on their nuclear weapons modernisation and expansion programmes, a few developments relevant to disarmament did take place this last quarter of 2024. Indonesia, Sierra Leone and Solomon islands handed in their instruments of ratification to the **Treaty on Prohibition of Nuclear Weapons**. This has taken the total number of States Parties that have ratified the treaty to 73. The total number of signatories are 94 at the end of 2024.

For the first time since 1989, it was decided that **the United Nations will establish a panel of experts** next year to examine the effects of nuclear war. In a resolution adopted on 1 November 2024 at the UN General Assembly First Committee on Disarmament and International Security, 144 states voted in favour of setting up a new panel of 21 experts to study the physical effects and societal consequences of a nuclear war. Only three states voted against the resolution—nuclear-armed France, Russia, and the United Kingdom. Most other nuclear-armed states—Democratic People's Republic of Korea, India, Israel, Pakistan, and the United States—abstained, while China voted in favour. The resolution was tabled by Ireland and Aotearoa New Zealand, who explained that the new study, which will report to the First Committee in 2027, "will deliver a stronger evidence base that will inform the world and contribute to constructive dialogue with a view to convergence in work on nuclear disarmament and arms control," and that it will also strengthen the taboo against nuclear weapons.

On Dec 10, 2024, the **Nobel Peace Prize** was awarded to Nidon Hidankyo, a Japanese organisation of atomic bomb survivors of Hiroshima and Nagasaki. The prize recognised their "efforts to achieve a world free of nuclear weapons and for demonstrating through witness testimony that nuclear weapons must never be used again".

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 Air Power Studies [CAPS].

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.