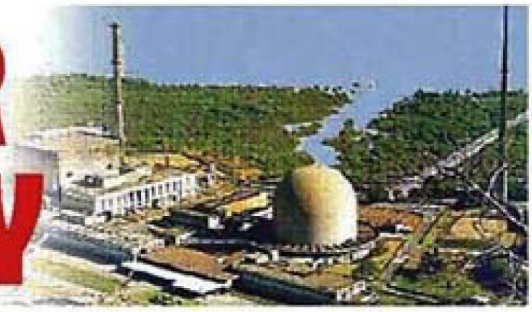
# NUCLEAR SECURITY



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

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**OPINION – Sitakanta Mishra**

## Towards Nuclear Energy Resurgence in India

India is on the cusp of nuclear energy resurgence as it jostles to scale up its nuclear power generation capacity. In the last 7 years, the installed nuclear power capacity has grown from 4780MW in 2014 to 6780MW by 2021, an increase of over 40%. Similarly, commercial generation of electricity from nuclear source has increased during last two decades. On progressive completion of the reactors under construction, the nuclear power generation capacity is expected to reach 22480 MW by 2031, catering 6-9% of India's immediate electricity requirements with comparable tariffs vis-à-vis those of contemporary base-load generating plants of other technologies. If this pace is maintained, nuclear energy can be part of the achievement pathways towards India's target to reduce Emissions Intensity of its GDP by 45 percent by 2030.

Until 2021, nuclear energy debate in India was framed within the prism of economic growth and energy security. With PM Modi's promise to achieve net zero emission by 2070 at the COP26 Summit in Glasgow in 2021, India's nuclear energy sector seems to have acquired its rightful place in the domestic debate over climate change goals and promotion of clean energy. More importantly, the government seems committed to grow nuclear power energy capacity with a concerted strategy to diversify the energy basket while aligning with India's climate change goals. To give boost to nuclear power generation, the government has brought necessary amendments to the existing legal framework, allowed new industrial players to have joint ventures with NPCIL, and approved new reactor construction in fleet mode besides accelerated domestic uranium production and import from external partners.


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As a formidable step towards planned expansion of nuclear energy sector, the Atomic Energy Act 1962, which limited nuclear

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activities exclusively to the Government PSU, was amended in 2015 to enable the licensing of NPCIL joint ventures for setting up nuclear projects. "To boost domestic investment", to meet large equity requirements in nuclear sector, joint ventures have been formed by NPCIL with public sector majors like NTPC and Indian Oil Corporation Ltd. (IOCL). Indian Railways, ONGC, and NALCO Power Ltd. are other entities which might step into nuclear sector in future.

So far, three joint venture companies – Anushakti Vidhyut Nigam Limited (NPCIL-NTPC Ltd.), NPCIL-IOCL and NPCIL- NALCO have been incorporated. Exploratory discussions have also been held with other public sector companies and Indian Railways in this regard. It is projected that NTPC, having 49 per cent equity share capital, would infuse up to Rs 1,000 crore investment and set up nuclear plants up to at least 2,000MW. NTPC is planning to make its debut in the nuclear sector by constructing two reactors (700MW) in Gorakhpur (Haryana), and subsequently another two reactors in Madhya Pradesh.

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Currently, 22 reactors with total capacity of 6780MW are in operation in India; 10 reactors, totalling to 8000MW, are at various stages of construction. Meanwhile, the government has accorded administrative approval and financial sanction for 10 more reactors to be set up in fleet mode whose pre-project activities have commenced, which will add 7000MW. It is expected that by 2031, nuclear power generation in India will triple (22,480MW) from the current level, which is highest in the world after China. To ensure uninterrupted reactor operation, the government has made necessary arrangements to supply adequate quantity of fuel from both domestic and imported sources. The government has accelerated domestic uranium exploration and production process as the current production of uranium is not adequate to meet the annual fuel requirement of uranium-based reactors. The Atomic Minerals Directorate for Exploration and Research (AMD) is carrying out integrated and 'multi-disciplinary field exploration' "employing world's latest technology for airborne geophysical surveys" in around a dozen states in India to accelerate domestic uranium production.

Meanwhile, uranium for BWRs and VVERs are met from the imports from Russia. During 2022-23 financial year, 133 fuel assemblies are scheduled to be imported besides 100 MTU of natural uranium import during the same period. India has "entered into uranium purchase agreement with Russia, Canada, Kazakhstan and Uzbekistan." A strategic reserve of imported natural uranium is maintained at Nuclear Fuel Complex (NFC) for enabling uninterrupted supply of fuel to reactors under IAEA safeguards. Today all Indian nuclear reactors are running with maximum capacity factor.

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The all-weathered India-Russia nuclear energy partnership, especially Rosatom's uninterrupted joint ventures, kept India's nuclear energy sector upbeat despite all odds. In addition, the Indo-US civil nuclear deal unshackled India of the multilateral non-proliferation regimes and facilitated Indian nuclear establishment to augment reactor capacity with imported nuclear fuel. In December 2018, Unit 1 (indigenous PHWR) of Kaiga Generating Station achieved a world record feat in continuous operation of nuclear power reactors by clocking 962 days of non-stop run with a capacity factor of 99.3%.

With the availability of adequate nuclear fuel and clear political mandate, Indian nuclear sector is on the course of resurgence. There is no looking back in

India's nuclear energy journey, especially under Prime Minister Narendra Modi's leadership.

*Source: https://timesofindia.indiatimes.com/blogs/voices/towards-nuclear-energy-resurgence-in-india/, 06 November 2022.*

**OPINION – S Ramadorai, Raman Srinivasan**

**A Nuclear Spring**

COP26 concluded a year ago in Glasgow, Scotland. COP27, or the 27th United Nations Climate Change Conference in Sharm El Sheikh, Egypt, is now attracting our attention. Over 90 heads of states and representatives from 190 nations are attending this event. In the meanwhile, the war in Ukraine has altered long-held assumptions. German factories are shutting down due to unbearable energy costs. The winter has been mild in Europe, so far.

The focus at COP27 has rightly shifted from promises to action, from pledges to implementation. Discussions are focussed on how to replicate success stories and how to scale success in a quick, time-bound manner. There is a renewed emphasis on partnership and collaboration, resulting in action. While there has been great progress in wind and solar as renewable energy sources, there is also a realisation that such sources alone are not entirely adequate. A new global consensus is emerging that nuclear energy is an indispensable component in assembling a climate change solution. The operating lifespans of old nuclear power plants are being extended. New nuclear power plants are being built, for example, in Finland, led by their Green party. Private investments are pouring into 80+ advanced nuclear startups across the world. Scientists and entrepreneurs are working on novel approaches that lead to the creation of affordable and safe nuclear power. One German scientist-entrepreneur, Dr. Bjorn Peters of Dual Fluid, poetically described his nuclear power reactor as "a bottle with no moving parts but a complex inner life." A variety of new approaches, new technologies, and new ecosystems define this second coming of nuclear power. Some startups are focused on making nuclear fuels and reactors investible. Others are focussed on developing technologies that make nuclear power plants insurable. However, the commercial deployment of these advanced nuclear power generators is at least five, if not 10 or 20 years away. There is a great sense of urgency at COP27. How can India help?

**A new global consensus is emerging that nuclear energy is an indispensable component in assembling a climate change solution. The operating lifespans of old nuclear power plants are being extended. New nuclear power plants are being built, for example, in Finland, led by their Green party. Private investments are pouring into 80+ advanced nuclear startups across the world. Scientists and entrepreneurs are working on novel approaches that lead to the creation of affordable and safe nuclear power.**

The pioneer of nuclear energy in India, Homi Bhabha, famously declared "No energy is as dangerous as no energy" and laid the foundations of India's nuclear programme, almost 70 years ago. He recognised that India had very limited uranium reserves but an abundance of thorium-rich sands. Therefore, he formulated an audacious three-stage program to achieve energy independence. The first stage has resulted in the building of several world-class Pressurised Heavy Water reactors across India. We owe a debt of gratitude to our atomic scientists and engineers for their hard and innovative work in the face of persistent technology denial regimes.

Recently, the government of India, in a commendable decision, announced the construction of ten nuclear power plants in fleet mode. This is a significant step forward not only towards the industrialisation of the nuclear power sector but also a necessary step to meet our declared goal of "Net Zero" by 2070. Our nuclear engineers and scientists have achieved a certain amount of perfection in the design of power plants, and building them in fleet mode is now eminently feasible. The private sector of the nuclear power

industry is now being encouraged to partner with our Nuclear Power Corporation in the buildout of nuclear energy.

By design, our PHWRs are modular in nature. On account of sustained research and engineering efforts, Indian PHWRs have established an enviable safety and performance record. Furthermore, our nuclear power plants have also demonstrated global cost-leadership. Reflecting our belief in the Vedic adage sarve janah sukhino bhavantu (May all in the world be happy) and with a certain generosity of spirit, we must consider sharing Indian nuclear energy technology with the larger world as our contribution to mitigating climate change.

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Surprisingly enough, this could well be an effort that would attract considerable global goodwill, partnership, and investment. In the first instance, this may indeed appear to be a dramatic shift from what we might have expected. India is recognised as a credible and responsible nuclear power in the larger world today and is also increasingly recognised as a technology and solution provider to vexing global problems. The two primary impediments to the spread of nuclear energy have been the problems posed by the proliferation of nuclear weapons and the disposal of nuclear waste. Multiple nuclear startups with innumerable technological innovations appear to be on the verge of addressing these twin obstacles.

**India could play a prominent and profitable role in addressing climate change by sharing our deep expertise in nuclear power generation. One of our leading nuclear experts, Anil Kakodkar, has suggested that mixing thorium with low-enriched uranium could be an effective way of addressing both proliferation and waste disposal concerns.**

Once these two problems are addressed in a satisfactory way, India could play a prominent and profitable role in addressing climate change by sharing our deep expertise in nuclear power generation. One of our leading nuclear experts, Anil Kakodkar, has suggested that mixing thorium with low-enriched uranium could be an effective way of addressing both proliferation and waste disposal concerns. Convergently, the US department of energy has also been advocating a shift to high assay low-enriched uranium as the fuel of choice for all next-gen nuclear reactors.

However, despite all the investments, building out of next-gen reactors will continue to remain a challenge. As Bjorn Peters writes, "Unfortunately, the US and France have forgotten how to build large nuclear reactors efficiently, and Germany has forgotten to do so completely." We, in India, on the other hand, now have an unbroken history of building sophisticated, cost-effective, and safe nuclear power plants. We have a youthful and energetic population keen to be skilled. Our youth have proven their ability to work in all corners of the world, creating value wherever they live and work. The time may be right for India to partner and collaborate with major nuclear powers to address the apparently intractable problem of climate change. India can do so by powering the world with clean and safe nuclear energy. We can utilise Make in India for the nuclear power sector and share it with the world. Undoubtedly, this will lead to growth in multiple sectors of the Indian economy as well. We must welcome this nuclear spring.

*Source: https://www.financialexpress.com/opinion/a-nuclear-spring/2806684/, 12 November 2022.*

**OPINION – Smruti Deshpande**

**See Far, Shoot Furthest**

Russia's offensive in Ukraine, which has now entered its ninth month, has been dominated by the use of standoff weapons in a major manner. Russia has made extensive use of air, missile and

artillery bombardments on Ukrainian cities and military facilities. A form of non-contact warfare, standoff missiles have been used extensively from the beginning of the war in February 2022. Russia has used several precision standoff missiles to hit key targets in Ukraine. In retaliation, Ukraine too has been gathering similar weaponry from the West.

On the first day of the war, according to the US, Russia fired roughly 100 missiles from land and sea. This included rockets, short and medium-range ballistic missiles, cruise missiles and surface-to-air missiles. Among the weapons that Russia used were the subsonic 3M14 Kalibr (NATO has termed it as the SS-N-30A), which has a 450-kg payload and a range of 1,500-2,500 kms. Another missile, Iskander, a short-range ballistic missile, was also used by Russia. It has a range of 300-400 kms. Apart from these, Tochka, developed during the Cold War, was employed. It is a short-range ballistic missile and can carry conventional, nuclear or chemical warheads. The missile's maximum range of fire is 70 kms.

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According to reports, Russia had employed the Tochka armed with a 9N123K submunition warhead. The KH-31P, a supersonic anti-radiation missile with a standoff range, was used by Russia to knock out radar sites, according to *The Warzone*. Reuters reported that on October 10 these missiles tore into intersections, parks and tourist sites in the capital Kyiv. "The barrage of dozens of cruise missiles fired from air, land and sea was the biggest wave of air strikes to hit away from the front line, at least since the initial volleys on the war's first day, February 24," it said. These missiles, launched from land, sea and air targeted command and control facilities, air defence sites, air bases, facilities in the Black Sea port city of Odesa among other important targets. The novelty factor in this is that Russia, in the recent past, was not known to be using precision-guided missiles extensively, unlike the US.

***United States:*** The US established this way of fighting wars during Operation Desert Storm. The war was the first combat test of the cruise missile system. It also marked the first coordinated Tomahawk and manned-aircraft strike in history. According to the US' Public Broadcasting Service (PBS) Frontline, "Within the first few minutes of Operation Desert Storm, Tomahawk missiles launched from the battleships Missouri and Wisconsin struck with accuracy at Iraqi command centers, and radar installations." In the war, Tomahawks were used to destroy surface-to-air missile sites, command and control centres, electrical power facilities and were "credited with the destruction of Iraq's presidential palace." After the war, the US' major emphasis lay on increasing the standoff range of the air-delivered munitions and improving their accuracy and lethality. Missiles with standoff ranges include ballistic missiles, cruise missiles and glide bombs. The significance of such weapon systems is that they can be launched from a distance of up to hundreds and thousands of kilometres.

**Ukraine has asked the US for its Army Tactical Missile Systems (ATACMS), which the US refused as the Guided Multiple Launch Rocket Systems (GMLRS) that they have sent by the thousands (as per *The New York Times*) to Ukraine are sufficient to hit their targets even in Crimea.**

Ukraine has asked the US for its Army Tactical Missile Systems (ATACMS), which the US refused as the Guided Multiple Launch Rocket Systems (GMLRS) that they have sent by the thousands (as per *The New York Times*) to Ukraine are sufficient to hit their targets even in Crimea. The long-range missile, ATACMS can strike up to 190 miles (300 kms), with the warhead carrying 375 pounds of explosives.

The ATACMS is the US Army's oldest surface-launched missile in service. It was developed in

the 1980s against the Soviet Union. This weapon has been fired by the US during Operation Desert Storm to strike Iraq's medium-range ballistic missile launchers and surface-to-air missile sites. It is because of the range of this missile that Ukraine wants to procure this missile. As *The New York Times* puts it, "Compared to the GMLRS, the version of the ATACMS that Ukraine wants carries an explosive warhead that is about 50 per cent larger and can strike targets more than three times as far." The US daily reported that a prototype of its replacement is being test-fired in New Mexico. "That weapon, called the Precision Strike Missile, will fly to ranges previously barred by the Intermediate-Range Nuclear Forces Treaty," the report stated.

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This goes to show how Russia and the US are investing in building more missiles of longer standoff ranges. The US, in fact, is advocating the use of long-range missiles in the Indo-Pacific for countries such as Japan and Australia, to safeguard the region against China. In an interview to Nikkei Asia, the US Commander of the Marine Corps Forces Pacific, Lt Gen. Steven Rudder Rudder stated that long-range strike capabilities are crucial for the US and Japan to deter hostile military activities in the Western Pacific. Lt Gen. Rudder said the use of US land-based naval strike missiles, acting in concert with Japanese-made Type 12 surface-to-ship cruise missile units, "allows us to conduct sea denial operations."

Japan's surface-to-ship missiles currently have a range of over 100 kms, but there are plans to extend this distance beyond 1,000 kms, putting coastal areas of China and North Korea in reach. Nikkei Asia said Washington was believed to be in talks with Tokyo over deploying an anti-ship missile unit, aiming to place it in Japan by around 2027. This comes in the backdrop of the PLA firing five ballistic missiles that landed inside Japan's exclusive economic zone as a part of simulating a blockade of Taiwan in the Taiwan Strait. Lt Gen. Rudder's comments came a day after Japan announced that it would start producing longer-range missiles and research hypersonic missile systems to combat escalating regional tensions.

In July, the US State Department approved a USD 23 million sale of 80 Joint Air-to-surface Standoff Missile-Extended Range (JASSM-ER) missiles to Australia. The stealth cruise missiles have a 935 kms range and can be deployed from the Royal Australian Air Force's (RAAF) F-35 Lightning II or F/A-18F Super Hornet fighters.

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The US has upped its game when it comes to standoff missiles. CNN, quoting a defence official, reported that the US successfully tested a hypersonic missile in mid-March but kept it quiet for two weeks to avoid escalating tensions with Russia as President Joe Biden was about to travel to Europe. In a first test of the Lockheed Martin version of the system, the Hypersonic Air-breathing Weapon Concept (HAWC) was launched from a B-52 bomber off the west coast. The country is far behind China and Russia in developing, testing and fielding hypersonic weapons. Most recently in October, the US test launched a rocket for the development of hypersonic weapons. The rocket carried 11 experiments to test and gather information for hypersonic weapons. The country has prioritised development of hypersonic missiles after China's tests and Russia usage of hypersonic missiles in its invasion of Ukraine.

Apart from this, the race for hypersonic missiles is growing by the day. Russia unveiled a weapon called the Kinzhal in 2017 and a hypersonic boost-glide vehicle, the Avangard, in 2019. China paraded a rocket-boosted hypersonic glide vehicle (HGV), the Dongfeng-17, in a recent military parade. *Foreign Policy* reported that the Pentagon's fiscal year 2023 budget request asks for USD 4.7 billion for research on hypersonic weapons, a boost from USD 3.8 billion in fiscal year 2022. According to *Science*, "Australia is collaborating with the United States on a Mach 8 HGV, and India with Russia on a Mach 7 HCM. France intends to field an HCM by 2022, and Japan is aiming for an HGV in 2026, the US Congressional Research Service noted in a July 2019 report."

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***China:*** A number of studies has shown that China has developed capabilities to strike the US and its allies with space-based weapons, laser weapons, nuclear arsenal and electromagnetic rail guns and hypersonic missiles. A 2021 study by Lowy Institute suggested that China can strike Australia from its bases using the long-range bombers and missiles. China has developed formidable military capabilities for itself. Last year in October, according to US intelligence, China tested a nuclear-capable hypersonic missile in August that circled the globe before speeding towards its target, demonstrating an advanced space capability that caught US intelligence by surprise. This test missed the target by 32 kms.

But given that it was an initial test, Pentagon officials called the test "close enough." *The Financial Times*, which brought out the first report regarding the matter, stated that the Chinese military launched a rocket that carried a hypersonic glide vehicle which flew through low-orbit space before cruising down towards its target. *The Guardian* reported that the test is believed to have also included the release of a separate missile that rocketed away, falling harmlessly into the South China Sea.

Neither the US nor Russia has demonstrated this ability. Glide vehicles are launched into space on a rocket but orbit the earth under their own momentum. They are slower than ballistic missiles, flying five times the speed of sound. The difference is that the shape of the vehicle allows it to manoeuvre toward a target, away from the defences. This makes it harder to track. China is focusing on its nuclear capability. Satellite data revealed China's construction of new nuclear missile silos in Gansu and Xinjiang in western China. The country is known to have maintained only about 20 silo-based ICBMs, the Carnegie Endowment for International Peace stated. But satellite imagery showed that the country is likely constructing more than 200 new missile silos.

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In 2019, China unveiled a hypersonic medium-range missile, the DF-17, which can travel around 2,000 kms and carry nuclear warheads. In June 2022, China tested a land-based missile-interception system that "achieved its expected purpose," as per China's defence ministry. This goes to show how China has been ramping up research into all sorts of missiles, those that can destroy satellites in space to advanced nuclear-tipped missiles. According to China's state media, the country has been conducting anti-missile system tests since 2010. While on the one hand, China has been building formidable missile capabilities, on the other hand

it has also been conscious of building missile defence systems that will safeguard the country against incoming missiles.

In 2018, China announced that it had successfully tested its first cutting-edge hypersonic aircraft that can carry nuclear warheads and penetrate any current generation anti-missile defence systems. The Xingkong-2 or Starry Sky-2, was launched in a target range located in Northwest China, the state-run China Academy of Aerospace Aerodynamics (CAAA) said in a statement. Launched in a rocket, China's waverider was released in the air after about 10 minutes. It flew independently, made large-angle turning manoeuvre and landed in the targeted area as planned, the statement said. The flight vehicle reached 30 kms in altitude at Mach 5.5-6. The hypersonic aircraft was designed by the CAAA in collaboration with the China Aerospace Science and Technology Corporation. Waverider is a flight vehicle that flies in the atmosphere and uses shockwaves generated by its own hypersonic flight with the air to glide at high speed, Song Zhongping, a military expert told the state-run *Global Times*.

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In May this year, China tested a new air-breathing engine during a simulated flight test achieving hypersonic speed. Chinese scientists have found a breakthrough in creating a hypersonic missile that will use hydrocarbons as fuel and employ a rotating detonation engine. This new engine will help power a plane or a missile up to five times the speed of sound or even faster.

Further, China is trying to create a hypersonic weapon that can hit a moving target while itself moving at five times the speed of sound. *The South China Morning Post* stated that the group of scientists developing this have been given a deadline of 2025 to provide technology for next-generation hypersonic missiles. Early this year, the PLAN released the first video footage of a Chinese warship, the Type 055 cruiser, firing a YJ-21 hypersonic anti-ship ballistic missile. Anti-ship missiles act as China's anti-access/area-denial (A2/AD) capabilities.

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China has an important asset in the form of its Rocket Force, known as The People's Liberation Army Rocket Force (PLARF), which is responsible for organising, manning, training, and equipping China's strategic land-based nuclear and conventional missile forces as well as their supporting elements and bases. The PLARF has been rapidly expanding and modernising, as per the country's evolving strategy regarding deterrence.

***India:*** The late Chief of Defence Staff Gen. Bipin Rawat (retd) had in September 2021 said India may raise a rocket force of its own, which could potentially control and maintain the country's missiles. While this was a welcome announcement, in a way it was looking at the stark capability gaps between India and China. The PLARF is believed to have the ability to strike against critical Indian military and civilian targets. Hence, while a rocket force is the need of the hour, no progress has been made on such an exclusive force. But tests of different missiles are regularly undertaken.

In 2021, air-launched variants of the Brahmos missile, extended range Pinaka rockets, a new vertically-launched short-range surface to air missile and the Agni Prime ballistic missile were tested by the DRDO. The DRDO and the IAF also

test-fired the indigenously designed and developed Standoff Anti-tank (SANT) missile from the Pokhran ranges. The missile has a range of over 10 kms. The DRDO also tested a long-range bomb and smart airfield weapons for the IAF.

In October 2022, the DRDO test-fired the Agni Prime new generation ballistic missile. It is the latest and sixth variant of the Agni series missiles. Agni Prime is a new generation advanced variant of the Agni-class of missiles with range capability of 1,000-2,000 kms. Agni-V, with a range of 5000 kms, which uses a three-stage solid fuelled engine, is India's contender for the ICBM. It was tested last year in October. Prithvi, a short-range surface-to-surface missile, has a range of 350 kms. In August 2021, India test-fired the 1000-km range Nirbhay cruise missile from the Chandipur testing facility. The subsonic cruise missile was fired tested for 100 km in flight. The firing was a partial success. It carries a convention warhead of 300 kgs weight and can hit targets up to 1500 kms. The missile is capable of flying between 50 metres and four km from the ground.

**The DRDO is developing a carrier vehicle for hypersonic and long-range cruise missiles. It successfully tested a Hypersonic Technology Demonstrated Vehicle (HSTDV), using the indigenously developed scramjet propulsion system and demonstrating its hypersonic air-breathing scramjet technology.**

The Indian Army in May 2022 decided to acquire two Akash Prime missile regiments. Capable of simultaneously engaging multiple targets in group mode or autonomous mode, the Akash missile system has a built-in Electronic Counter-Counter Measures (ECCM) features and has been configured for a mobile platform. The full system comprises a launcher, a set of missiles, a control centre, a built-in mission guidance system, a C4I (command, control communication and intelligence) centre and supporting ground equipment in addition to its radar, which has been christened Rajendra. It has an operational range of about 30 km and flight altitude of around 18 km.

The Nag anti-tank guided missile has already been inducted into the services. It has a range of about 20 kms. The Medium Range Surface to Air Missile systems was given to the IAF's 2204 Squadron in September 2022, *The Indian Express* reported. According to the report the air-to-ground Udram, a New Generation Anti-Radiation Missile (NGRAM), has cleared initial tests and "some more tests will be conducted soon." It has a maximum range of around 200 kms.

The BrahMos in use with the forces has a 300-500 km range and is a short-range, ramjet-powered, single warhead, supersonic anti-ship or land attack cruise missile. In May this year, India successfully tested an extended-range Brahmos missile with a 450-km range from a Sukhoi fighter. The DRDO is developing a carrier vehicle for hypersonic and long-range cruise missiles. It successfully tested a Hypersonic Technology Demonstrated Vehicle (HSTDV), using the indigenously developed scramjet propulsion system and demonstrating its hypersonic air-breathing scramjet technology.

While India is one of the top countries in manufacturing missiles, it still has a long way to go when compared with China, Russia and the US. The ranges of missiles India has will need to be enhanced to strike targets located afar. For this, technologies such as seekers play a very important role. Being a coveted technology, the seekers are not easily available. While the DRDO is developing this technology, it is a slow process. At a time when the nature of warfare has taken a flight into the future and is heavily guided by artificial intelligence, the use of standoff weapons for countries like India, who are yet to build a state-of-the-art AI infrastructure, remains important.

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*Source: https://forceindia. net/cover-story/see-far-shoot-furthest/, 06 November 2022.*

**OPINION – Zaheena Rasheed**

## After Record Year of Arms Tests, What's in North Korea's Arsenal?

From ICBMs to hypersonic weapons that can potentially evade defences, and rockets fired from railcars, submarines and road-mobile launchers, North Korea has carried out a record number of missile tests this year. It is also believed to be preparing for its first test of a nuclear weapon in five years. For Leader Kim Jong Un, these weapons — which he has pursued in defiance of some of the world's toughest sanctions — are crucial to defending his rule against any potential attacks from what he views as "hostile forces", in essence, the US and South Korea.

**Kim's ultimate goal may be to invade South Korea — as his grandfather Kim Il Sung unsuccessfully tried to do in 1950 — and to deter Washington from coming to Seoul's aid in the event of war. And although the 38-year-old leader initially appeared open to disarmament, he firmly shut that door in September, declaring North Korea's status as a nuclear-armed state "irreversible" and approving a new law that enshrined the right to use a pre-emptive atomic attack.**

Some analysts believe Kim's ultimate goal may be to invade South Korea — as his grandfather Kim Il Sung unsuccessfully tried to do in 1950 — and to deter Washington from coming to Seoul's aid in the event of war. And although the 38-year-old leader initially appeared open to disarmament, he firmly shut that door in September, declaring North Korea's status as a nuclear-armed state "irreversible" and approving a new law that enshrined the right to use a pre-emptive atomic attack. "Through unheard of sanctions and blockade(s) … they are trying to lead us but to give up the nuclear weapons of our own accord," Kim told a session of the country's rubber-stamp parliament on September 8. "But never!" he said. "Let them impose sanctions for 100, nay 1000 days, or even 10 or 100 years."

***What will a Seventh Nuclear Test Involve?*** Four of North Korea's six nuclear tests have taken place under Kim, who assumed power in 2011. All of these detonations have happened at the Punggye-ri site, a mountainous area in North Hamgyong province. The first atomic test in October 2006 measured less than one kiloton, while the last one in September 2017 had an estimated force, or yield, of up to 250 kilotons. That is at least 16 times more powerful than the 15- to 20-kiloton bombs that the US used to destroy Japan's Hiroshima and Nagasaki in 1945. Hans Kristensen and Matt Korda at the Bulletin of the Atomic Scientists estimate that Pyongyang may currently possess enough fissile material — the core material in atomic bombs — to build 45 to 55 nuclear weapons and may now have assembled 20 to 30 warheads.Bottom of Form Others believe the numbers may be higher.

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Ankit Panda, senior fellow at the Carnegie Endowment for International Peace, told Al Jazeera in a recent interview that North Korea probably has 40 to 70 manufactured nuclear warheads. "Some of those warheads will be higher yield, thermonuclear weapons, and most of those warheads will be fission weapons with relatively lower … nuclear yields," he said.

Experts now say a seventh North Korean atomic test is imminent, with satellite imagery again indicating the excavation of tunnels and construction of support buildings at Punggye-ri. Vann Van Diepen, an expert on weapons of mass destruction and non-proliferation at the Stimson Center, told Al Jazeera

that the expected test could involve the detonation of a "super-sized" nuclear warhead with a larger yield than the last bomb. Or it could involve a smaller and more light-weight "miniaturised" warhead that can be fitted on short-range missiles for "tactical" or battlefield use. Possessing this ability could also allow North Korea to mount several such warheads on one ICBM, allowing a single missile to strike several targets at once. Van Diepen said North Korea would need to engage in many more tests in order to obtain such a "tactical nuke". He also cautioned that even when the detonation takes place, "we may or may not be able to figure out what it is they tested, because on the outside, there's very limited information available about what happens in one of these tests, and therefore, what they might be testing".

**While North Korea has dozens of nuclear bombs, it is not clear if it has the ability to deliver those weapons to enemy targets in South Korea, Japan and the US. Experts say this ability rests on several criteria. First, North Korea needs to develop missiles that can fly those distances, and second, it needs to be able to fit its nuclear weapons on to these short, medium and long range missiles.**

***Can North Korea Strike South Korea, Japan and the US?*** While North Korea has dozens of nuclear bombs, it is not clear if it has the ability to deliver those weapons to enemy targets in South Korea, Japan and the US. Experts say this ability rests on several criteria. First, North Korea needs to develop missiles that can fly those distances, and second, it needs to be able to fit its nuclear weapons on to these short, medium and long range missiles.

**A UN panel of experts reported IN 2021 that an anonymous member state had assessed that North Korea does indeed have the ability to mount nuclear warheads on its short, medium, and long-range ballistic missiles. If this is true, it means Pyongyang has nuclear-tipped missiles that can strike its neighbours. But there remain additional questions over its ability to hit the US.**

Experts judge Pyongyang has the first capability. They say it has had missiles that can strike its neighbours for decades now, and in 2017, demonstrated a capacity to fly a missile as far as continental US, with a successful test of the Hwasong-15, a rocket that reportedly has a range of 12,874km (8,000 miles). In March of this year, North Korea also claimed to have tested a missile with an even longer range, the Hwasong-17 or "monster missile". But there is uncertainty over whether North Korea can miniaturise its nuclear bombs so they can fit inside the nose of its missiles.

A UN panel of experts reported IN 2021 that an anonymous member state had assessed that North Korea does indeed have the ability to mount nuclear warheads on its short, medium, and long-range ballistic missiles. If this is true, it means Pyongyang has nuclear-tipped missiles that can strike its neighbours. But there remain additional questions over its ability to hit the US. This third aspect has to do with its ICBM technology. Once launched, these projectiles travel into outer space and then re-enter the Earth's atmosphere before plunging rapidly to hit their targets. Experts say Pyongyang is yet to show whether it can manufacture a heat shield capable of protecting a nuclear device during a violent atmospheric re-entry.

John Tierney, the executive director of the Center for Arms Control and Non-Proliferation, said some experts do not believe "North Korea has yet mastered any ability to actually miniaturise and place a weapon successfully" on an ICBM, and they also doubt whether it has perfected "an ability of the missiles to successfully withstand re-entry speeds and temperatures". He noted that North Korea's most recent ICBM test was judged to be a failure but said concerns exist as Pyongyang is "continuing to test and improve at a fairly quick pace". Others say that although North Korea has not yet tested a re-entry vehicle, it may still possess this capacity. "They have not sent out vessels with telemetry capabilities to track missiles coming down into the water," said

Mark Fitzpatrick, associate fellow at the International Institute for Strategic Studies. "And because we have not seen this re-entry capability, some people say North Korea doesn't know how to do it. But I believe they probably can, that their engineers, their scientists are capable. And they've done so many missile tests that even though they haven't had a re-entry test, per se, they probably can do it."

Other capabilities that North Korea has sought to advance in 2022 include missile manoeuvrability or ability to evade defences, as well as launches from different platforms, including railway carriages and a new experimental submarine, all of which may make it difficult for enemies to detect and destroy these weapons.

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North Korea has also tested missiles that are solid-fuelled, a technology that makes the rockets easier to transport and faster to launch than liquid-fuelled ones. Despite these reported advances, experts note that the US – which has bases and troops in South Korea and Japan – retains an overwhelming nuclear and conventional military superiority over North Korea.

Fitzpatrick said Washington has the ability to strike North Korea using missiles launched from its submarines in the Pacific and from B-52 bombers as well as using intermediate missiles launched from Guam and ICBMs launched from the west coast in California. So, in effect, he said he expected there to be a kind of "mutual deterrence" in Northeast Asia, where "North Korea will deter US from launching a preemptive war and the US will deter North Korea from using nuclear weapons".

*Source: https://www.aljazeera.com/news/2022/11/9/after-a-record-year-of-arms-testing-what-is-in-n-koreas-arsenal, 09 November 2022.*

## NUCLEAR STRATEGY

### CHINA

### US Military Nuclear Chief Sounds the Alarm about Pace of China's Nuclear Weapons Program

The Commander of US Strategic Command, which oversees the US nuclear weapons program, warned that China is developing nuclear weapons much faster than the US and called the issue a "near-term problem," during a speech at a closed event…. While Pentagon officials have been sounding the alarm about China's military build-up and development of nuclear weapons for years, Richard's comments paint the situation as more dire than other officials have stated publicly. "As I assess our level of deterrence against China, the ship is slowly sinking," Adm. Charles Richard said. "It is sinking slowly, but it is sinking, as fundamentally they are putting capability in the field faster than we are." Richard called the development of China's nuclear weapons program a "near-term problem."

**The Biden administration has consistently called China the US's main global competitor and warned about the country's development of its military and nuclear weapons program in a series of policy documents explaining the US's defense and military strategy released at the end of October.**

"As those curves keep going, it isn't going to matter how good our [operating plan] is or how good our commanders are, or how good our forces are – we're not going to have enough of them. And that is a very near-term problem." Richard made the comments during a speaking engagement at the Naval Submarine League Annual Symposium on Wednesday. The event was closed to the public, but Richard's comments were published in a Department of Defense news article….

The Biden administration has consistently called China the US's main global competitor and

warned about the country's development of its military and nuclear weapons program in a series of policy documents explaining the US's defense and military strategy released at the end of October. China is the US's "pacing challenge" because it is "the only competitor with both the intent and increasingly the capability to systematically challenge the US across the board, militarily, economically, technologically, diplomatically," a senior defense official said about the strategy.

**China "likely intends to possess at least 1,000 deliverable warheads by the end of the decade," the Nuclear Posture Review, one of the policy documents, said of China's nuclear weapons program. Richard warned of China's nuclear development in 2021, calling their program a "strategic breakout." "We are witnessing a strategic breakout by China.**

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*Source: Ellie Kaufman and Barbara Starr, https://edition.cnn.com/2022/11/04/politics/us-china-nuclear-weapons-warning/index.html, 04 November 2022.*

**FRANCE**

**Macron Seeks to Allay Concerns over Nuclear Arms Policy**

President Emmanuel Macron attempted to assure allies that France hasn't changed its nuclear strategy as he presented the country's new military goals. "France's vital interests have a European dimension," Macron said in the southern city of Toulon on 09 November 2022. "France is a balancing power that assumes its responsibilities as a reliable partner to protect multilateralism and international law." In a televised interview in October, 2022, the French leader said he would not respond in kind to a tactical nuclear attack by Russia on Ukraine, or in the region. That led to a heated discussion at home and abroad about what Macron meant and why he was discussing a taboo topic. Some wondered if he was preparing to alter the French nuclear doctrine, which only allows the use of such weapons to defend the country's vital interests without clearly defining them.

***'Vital Interests':*** On 09 November, Macron said it was his responsibility to "define and update" these "vital interests," but didn't delve into specifics. "Let's not forget that France indeed can rely on nuclear dissuasion and let's not sometimes dramatize what is being said," he added, without clarifying. Macron is constantly fighting criticism that he is soft on Vladimir Putin, especially in Eastern Europe, as he has sought to maintain dialog with the Russian president, and the comments also stoked that perception in some quarters.

**Macron reaffirmed the country's attachment to the NATO military alliance and warned that Europe wasn't sheltered from missile or drone strikes. He added that France would "propose and contribute" to Europe's air defense systems. "Our continent's air defense can't be limited to promoting one national industry or be conducted at the expense of European sovereignty," he said.**

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national industry or be conducted at the expense of European sovereignty," he said.

***France-UK Cooperation:*** He also called for renewed defense cooperation with the UK, and said there would be a bilateral summit between the two partners in the first quarter of 2023. The event in Toulon marked the strategic review of French defense ambitions for 2030. The country is the only one in the European Union equipped with nuclear weapons, which account for around 20% of its current defense budget. The government has yet to unveil its detailed defense budget forecast for 2024-2030, which Macron said would focus more on online influence and cyber defense. The law will be presented to parliament early next year, he said. Macron spoke in October shortly after Putin suggested he would resort to tactical nuclear weapons, but there was no sense the Russian leader was moving nuclear assets.

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*Source: Ania Nausbaum, https://www.bloomberg. com/news/articles/2022-11-09/ macron-seeks-to-allay-concerns-over-france-s-nuclear-arms-policy, 09 November 2022.*

**USA**

**US Flies Nuclear-Capable B-1B Strategic Bombers Over South Korea**

US imperialism is sharply escalating tensions on the Korean Peninsula as part of its military build-up throughout the Indo-Pacific in preparation for war against China. [T]he US and South Korea conducted large-scale joint air force drills, code-named Vigilant Storm, involving more than 240 military aircraft. This was the latest large-scale joint war games between Washington and Seoul this year, ending the previous de facto agreement between North Korea and the Trump administration to scale down such exercises in exchange for a moratorium on Pyongyang's nuclear and long-range ballistic missile tests.

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Pyongyang responded to the war games with a spate of missile tests, included a suspected ICBM launch last Thursday. US Defense Secretary Lloyd Austin and South Korean Defense Minister Lee Jong-seop responded and announced plans at a joint press conference in Washington…for the de facto permanent stationing of US nuclear-capable assets in South Korea for the first time since 1991. While Austin described those deployments as rotations, Lee stated the US would send "strategic assets *to the level equivalent to constant deployment* through increasing the frequency and intensity of strategic asset deployment in and around the Korean peninsula [emphasis added]."

Washington and Seoul also extended last week's exercises for an extra day to Saturday and underscored their decision by flying two B-1B strategic bombers, accompanied by South Korean and US fighters, over the Korean Peninsula for the first time since 2017. While the US Air Force claims these bombers are no longer capable of carrying nuclear armaments, there is no reason to take the Pentagon at its word. The US previously flew a nuclear-capable B-52 bomber over the Osan Air Base, 50 km south of Seoul, in January 2016 following North Korea's fourth nuclear test.

Washington bears primary responsibility for these tensions in the region. North Korea has been a target of US imperialism since before the 1950-1953 Korean War. Years of brutal US-led sanctions have strangled the North Korean economy and left it isolated internationally, turning the Korean Peninsula into a powder keg. Far from seeking to ease tensions, Washington is intent on escalating them. The Biden administration stated in April 2021 that its policy on North Korea would "not focus on achieving a grand bargain, nor will it rely on strategic patience."

In other words, talks would only be held if Pyongyang effectively capitulates.

... Secretary Austin pointed to the US deployment of nuclear-capable F-35A fighter jets to South Korea in July for 10 days, the first such visit since December 2017. He also highlighted the visit of the nuclear-powered USS Ronald Reagan aircraft carrier to South Korea at the end of September, also for the first time in five years. The vessel and its strike group took part in joint exercises with South Korea and Japan. At their summit in May, Biden and newly elected South Korean President Yoon Suk-yeol agreed to deploy US strategic assets to the region. They also agreed to restart the Extended Deterrence Strategy and Consultation Group for the first time since January 2018. The group provides Washington and Seoul with the opportunity to discuss strategic and policy issues regarding so-called extended deterrence, including the use of nuclear weapons.

**Whether nuclear-capable US military assets deployed to South Korea will be armed with nuclear weapons or not is deliberately shrouded in secrecy. Under Washington's "Neither Confirm nor Deny" policy drawn up in 1958, the US does not comment on the locations of its nuclear weapons at any given time, which will only add to uncertainty and instability in the region.**

Whether nuclear-capable US military assets deployed to South Korea will be armed with nuclear weapons or not is deliberately shrouded in secrecy. Under Washington's "Neither Confirm nor Deny" policy drawn up in 1958, the US does not comment on the locations of its nuclear weapons at any given time, which will only add to uncertainty and instability in the region.

The US permanently based on the Korean Peninsula from 1958 to 1991, targeting the Soviet Union and China. In 1967, there were some 950 warheads in South Korea and both South Korea and Japan are still covered under the so-called US "nuclear umbrella," which includes strategic bombers, intercontinental ballistic missiles and submarines.

South Korea also had nuclear ambitions. In late 1971, South Korean military dictator Park Chung-hee first instructed his staff to draw up plans to develop nuclear weapons. Despite treaties with the US to the contrary, the Park government worked in secret to develop a nuclear bomb and a ballistic missile delivery system. Only in 1976 did Park bow to US pressure to give up the program, though Seoul's research into nuclear power continued.

The sheer scale of the US planned nuclear-capable deployments demonstrates that the target is not tiny, impoverished North Korea, but China. Each step Pyongyang takes provides the US with the pretext to flex its muscles while deepening trilateral cooperation with South Korea and Japan. As a result, the US bases in South Korea and the country itself are the frontline of any conflict with China. The US Kunsan Air Base is just 198 kilometres from the North Korean border and 950 kilometres from Beijing. Osan Air Base is just 80 kilometres from the border and 976 kilometres to Beijing. Moreover, the headquarters of Russia's Pacific Fleet near Vladivostok and nuclear facilities of both Russia and China are in easy range. Significantly in time of war, Washington would take operational control (OPCON) of South Korea's huge military, despite drawn-out negotiations to end the policy. By 2020 figures, the South Korean military has 550,000 active-duty personnel, the seventh largest in the world, 2,750,000 reservists, and is heavily armed with the latest armour, military aircraft and naval vessels.

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Washington is also expanding its anti-ballistic missile system throughout the region including in South Korea. Far from being defensive, it is designed to protect US bases from counterattack in any war the US instigates. This includes a recently upgraded THAAD battery in South Korea, which covers US military bases, but not densely populated cities like Seoul.

A second THAAD battery is stationed in Guam. THAAD operates with the AN/TPY2 X-Band radar, with two additional X-band radars stationed in northern and southern Japan. The de-stationing of nuclear-capable assets in South Korea makes clear that the US is rapidly preparing for nuclear war in conjunction with its military allies in the region. Even as it prepares to send such assets to South Korea, the US recently announced that it will station nuclear-capable B-52 bombers at Tindal air force base in northern Australia. It is also carrying out upgrades to airfields in northern Australia and on Guam, which is already home to nuclear-capable bombers. Washington clearly wants to put US nuclear-capable assets in Japan as well but the government confronts broad public opposition, stemming from the criminal US dropping of atomic bombs on Hiroshima and Nagasaki in 1945. Nevertheless, in February, former Prime Minister Shinzo Abe initiated a debate in Tokyo over Japan openly hosting US nuclear weapons.

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Even as the US and its NATO allies wage war against Russia in Ukraine, the Biden administration is in the advanced stages of preparing for, and provoking, conflict with China. Under the fraudulent banner of defending democracy, US imperialism is seeking to subordinate the Eurasian landmass and its huge human and natural resources, halt its historic decline and consolidate its global hegemony.

The International Youth and Students for Social Equality (IYSSE) has launched an international campaign calling on young people to build a unified anti-war movement of the international working class to halt the war in Ukraine and prevent a nuclear holocaust by fighting for a socialist future for humanity. The IYSSE will be holding an international online meeting on December 10 to launch this campaign.

*Source: Ben McGrath, https://www.wsws.org/en/articles/2022/11/07/euzy-n07.html, 06 November 2022.*

**2022 Nuclear Posture Review**

On October 27, 2022, the Biden administration released the unclassified version of its 2022 Nuclear Posture Review (NPR). The document states that nuclear weapons provide a unique deterrent that no other element of U.S. military power can replace and that a safe, secure, and effective nuclear deterrent undergirds all U.S. national defense priorities. The NPR supports retention of a triad and continued investments in all existing major nuclear modernization programs including land-based, sea-based, air-based, command and control, and some supplemental capabilities; however, it also states that "deterrence alone will not reduce nuclear dangers." The NPR puts a "renewed emphasis" on arms control, nuclear non-proliferation and risk reduction, policies that complement and mutually reinforce U.S. nuclear deterrence aims. The NPR identifies mutual, verifiable nuclear arms control as the most "effective, durable and responsible path" to reduce the role of nuclear weapons in U.S. strategy and prevent nuclear use.

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***Defining the Role and Purpose of Nuclear Weapons****:* The NPR affirms three roles for U.S. nuclear weapons: 1) to deter aggression, 2) to assure allies and partners and 3) to achieve U.S. objectives if deterrence fails. Similar to the 2010 NPR, the 2022 NPR states that "the fundamental role" of U.S. nuclear weapons is to deter a nuclear attack on the United States or its allies and partners. "While the United States maintains a very high bar for the employment of nuclear weapons," the NPR states that the U.S. nuclear posture "is intended to complicate an adversary's entire decision calculus, including whether to instigate a crisis, initiate armed conflict, conduct strategic attacks using non-nuclear capabilities, or escalate to the use of nuclear weapons on any scale."

**After a "thorough review," the NPR concluded that adopting a No First Use or Sole Purpose policy would result in an "unacceptable level of risk" in light of adversaries' non-nuclear capabilities which could inflict "strategic level damage" to the United States and its allies and partners. The NPR expresses a goal of moving toward a sole purpose doctrine, however.**

***Rejects No First Use and Sole Purpose****:* After a "thorough review," the NPR concluded that adopting a No First Use or Sole Purpose policy would result in an "unacceptable level of risk" in light of adversaries' non-nuclear capabilities which could inflict "strategic level damage" to the United States and its allies and partners. The NPR expresses a goal of moving toward a sole purpose doctrine, however.

***Circumstances for Nuclear Use****:* The US would consider using nuclear weapons only in "extreme circumstances" to defend the vital interests of the United States or its allies and partners. The NPR states that the United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to and in compliance with NPT, but for all other states, "there remains a narrow range of contingencies in which U.S. nuclear weapons may still play a role in deterring attacks that have strategic effect."

***Two Peer Nuclear Adversaries****:* The NPR states that the US is entering an unprecedented phase of facing two major nuclear powers as strategic competitors and potential adversaries, creating "new stresses on stability and new challenges for deterrence, assurance, arms control, and risk reduction." While Russia remains the most capable and diverse nuclear rival, China's increasing capability is identified as a threat to the US and allies. The NPR allows room for a reduction in the role of nuclear weapons in U.S. strategy toward Russia and China but requires verifiable reductions or constraints from both rivals in return.

***North Korea****:* The NPR also acknowledges the "persistent and growing danger" posed by North Korea's weapons of mass destruction and clearly states the dire consequences it would face in the event of nuclear weapons use: "There is no scenario in which the Kim regime could employ nuclear weapons and survive." With the ultimate goal being the complete and verifiable denuclearization of the Korean Peninsula, the NPR states U.S. policy calls for a "calibrated diplomatic approach to secure practical progress" to increase U.S. and allied security.

***Iran:*** The NPR states that "Iran does not today possess a nuclear weapon and we currently believe it is not pursuing one," but expressed concern over steps being taken by Iran that were previously constrained by the Iran nuclear deal. The NPR reiterates U.S. policy to work with allies to prevent Iran from obtaining nuclear weapons and push for limitations on Iran's weapons-applicable nuclear activities.

***Extended Deterrence Commitments****:* The NPR continues a longstanding U.S. commitment to allies and partners to tailor extended deterrence and assurance policies in response to regional security environments. It supports keeping NATO a nuclear alliance and modernizing and maintaining forward- armscontrolcenter.org deployed nuclear weapons and delivery systems in Europe, including the new F-35A Joint Strike Fighter and B61-12 gravity bomb.The administration also identifies the need to adapt

the European extended deterrent to current and emerging security conditions including through enhanced exercises and strengthening the coherence of both nuclear and non-nuclear NATO capabilities. Separately, the NPR calls for strong and credible nuclear deterrence in the Indo-Pacific to address nuclear and missile developments by China, as well as ongoing threats from North Korea and Russia. The NPR stresses cooperation with allies, including Japan, South Korea and Australia, and continuation of extended deterrence dialogues, including the capability to forward-deploy strategic bombers, dual-capable aircraft, and other nuclear weapons to the region.

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***New START Follow-On:*** The NPR states that the US is ready to negotiate expeditiously with Russia a new arms control framework to replace the New START, which expires in February 2026. While both countries support this effort, the NPR says each country's "priorities are not identical, underscoring the importance of dialogue, when conditions permit, to address each side's differing goals and perceptions of military systems that affect strategic stability."

**The 2022 Biden NPR concluded that the W76-2 currently provides an "important means to deter limited nuclear use" and retains the system, which will be periodically reassessed on its deterrent value as other systems come online and in light of the security environment and plausible deterrence scenarios.**

***Strategic Stability Dialogue with China:*** The NPR also emphasizes the need to engage China on a full range of strategic issues, despite its reluctance to engage, "with a focus on military de-confliction, crisis communications, information sharing, mutual restraint, risk reduction, emerging technologies, and approaches to nuclear arms control" including on fissile material production.

***Non-Proliferation Regime and Multilateral Arms Control:*** The NPR reaffirms U.S. commitment to the Nuclear Non-Proliferation Treaty, support for the International Atomic Energy Agency's safeguards system, including the Additional Protocol, support for strengthened strategic trade control and the adoption of nuclear weapon-free zones, commitment to bring the Comprehensive Nuclear-Test-Ban Treaty into force, and support for commencing Fissile Material Cut-off Treaty negotiations.

***Managing Escalation Risks:*** The NPR stresses the value of peacetime dialogue to decrease the likelihood of misperception and escalation in a crisis. Messaging, posturing of nuclear forces and crisis communication and management mechanisms are highlighted as strategies to manage escalation and possible misperception. Similarly, the NPR seeks to limit the possibility of U.S. misinterpretation of adversary intentions through effective intelligence analysis, wargaming and other strategies that offer "actionable insights."

***Support for the Sentinel ICBM:*** The NPR highlights full support for funding for the Sentinel ICBM program and the W87-1 warhead as a one-for-one replacement of the Minuteman III ICBM to maintain 400 ICBMs on alert. The NPR concludes that any alternative to the Sentinel program of record, including an additional Minuteman life extension, "would increase risk and cost."

***Retaining the W76-2 SLBM Warhead:*** The W76-2 "low-yield" SLBM warhead was introduced as a new requirement in the 2018 Trump NPR and quickly developed and deployed in 2019. The 2022 Biden NPR concluded that the W76-2 currently provides an "important means to deter limited nuclear use" and retains the system, which will be periodically reassessed on its deterrent value

as other systems come online and in light of the security environment and plausible deterrence scenarios.

***Cancellation of the Sea-Launched Cruise Missile***: The NPR cancels the "low-yield" nuclear-armed sea launched cruise missile (SLCM-N) after determining that it would be a redundant capability in light of the W76-2 (plus the B61-12 and LRSO), has uncertain utility in providing leverage to negotiate arms control limits on Russia's own non-strategic nuclear weapons, and would be too costly (estimated at $30+ billion) in light of other nuclear modernization programs and defense priorities.

**The NPR identifies restoring the ability to produce plutonium pits as a high priority for the next 10 years, endorsing a two-site strategy at the Los Alamos National Laboratory and Savannah River Site to eliminate single point failure. The NPR specifically argues that increased pit production will both guard against aging plutonium and allow new pit design to be manufactured.**

***Retirement of the B83 Gravity Bomb & HDBTs***: The NPR states that the B83-1 gravity bomb will be retired (no specific timeline for dismantlement provided) due to its increasingly limited capabilities and rising maintenance costs. To address hard and deeply buried targets (HDBTs), the United States will leverage existing capabilities in the near term and, "informed by existing concepts," will develop an enduring capability for improved defeat of such HDBTs, hinting at the future development of a new weapon.

**Li said the NPR released reveals how the United States, with its nuclear weapons in hand, observes the world and deals with other countries. "This document hypes up major-power competition and bloc confrontation, which reflects the logic of hegemonism seeking absolute military superiority. This is clearly against the world's desire to prevent nuclear war and avoid a nuclear arms race.**

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*Source: https://armscontrolcenter.org/2022-nuclear-posture-review/, 08 November 2022.*

**Chinese Disarmament Ambassador Blasts US Nuclear Posture Review**

Chinese Ambassador for Disarmament Affairs Li Song on 28 October blasted the newly released Nuclear Posture Review (NPR) of the United States. In his remarks at a plenary meeting of the First Committee of the UN General Assembly, Li said the NPR released reveals how the United States, with its nuclear weapons in hand, observes the world and deals with other countries. "This document hypes up major-power competition and bloc confrontation, which reflects the logic of hegemonism seeking absolute military superiority. This is clearly against the world's desire to prevent nuclear war and avoid a nuclear arms race" he said.

The latest U.S. nuclear strategy, together with its related policies and plans, will definitely have a complex, far-reaching and seriously negative impact on global strategic security and stability, the strategic security relationship among major powers, as well as on the international and multilateral nuclear arms control, disarmament and non-proliferation processes, he warned. In this NPR, the US has made irresponsible remarks and accusations as well as groundless speculation on China's normal modernization of its nuclear forces. It has brazenly "tailored" a nuclear deterrence strategy against China. China is seriously concerned about and firmly opposes such a move, said Li. We urge the U.S. not to assess China in the hegemonistic way that the U.S. behaves itself and imagine other countries as rivals or adversaries.

Li noted that China has the capability and confidence in safeguarding its national security interests and that China will not be intimidated by the nuclear blackmail of the U.S. "We urge the United States to abandon the Cold War mentality and the logic of hegemonism, pursue a rational and responsible nuclear policy, fulfill its special and primary responsibility in nuclear disarmament, and play its due role in maintaining global strategic stability and world peace and security" said Li.

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*Source: https://www.shine.cn/news/world/2210292028/, 29 October 2022.*

**USA–RUSSIA**

**NATO, Russia Conduct Simultaneous Nuclear Exercises**

NATO kicked off its annual nuclear exercise, dubbed Steadfast Noon, in mid-October, and Russia launched its scheduled Grom strategic nuclear exercises about a week later. The exercises heightened tensions more than usual this year, as they took place after Russia intensified its brutal assault on Ukraine and once again wielded threats of using nuclear weapons.

**The Steadfast Noon exercise involved 14 of NATO's 30 members and up to 60 tactical nuclear fighter jets and surveillance aircraft in Europe, with Belgium's Kleine Brogel Air Base serving as home base. U.S. officials noted in a very rare disclosure that some B-52H strategic bombers from U.S. Minot Air Force Base in North Dakota also participated.**

NATO Secretary-General Jens Stoltenberg on Oct. 11 rejected the prospect of cancelling the "routine training" of Steadfast Noon, saying doing so would send "a very wrong signal." "If we now created the grounds for any misunderstanding, miscalculation in Moscow about our willingness to protect and defend all allies, we would increase the risk of escalation," Stoltenberg said.

The Steadfast Noon exercise involved 14 of NATO's 30 members and up to 60 tactical nuclear fighter jets and surveillance aircraft in Europe, with Belgium's Kleine Brogel Air Base serving as home base. U.S. officials noted in a very rare disclosure that some B-52H strategic bombers from U.S. Minot Air Force Base in North Dakota also participated. The flights are intended to practice delivering U.S. B61 nuclear gravity bombs, although the aircraft will fly unarmed. The exercise will include flights over Belgium, the United Kingdom, and the North Sea. In advance of the exercise, Western officials emphasized that Steadfast Noon would not feature a scenario related to Ukraine and would take place more than 600 miles from Russia. The NATO exercise lasted two weeks, starting Oct. 17.

The Grom, or Thunder, exercise began Oct. 26. The last Russian exercise was in February, less than a week before Russia invaded Ukraine, under Russian President Putin's close supervision. The Russian exercises usually feature the deployment of strategic nuclear systems; launches of intercontinental ballistic missiles, as well as systems such as new hypersonic weapons; and large-scale military troop manoeuvres.

A Western official told Reuters on Oct. 13 that, with Grom occurring alongside the war in Ukraine, "we do have an additional challenge to really be sure that the actions that we see, the things that are occurring, are actually an exercise and not something else." But U.S. National Security Council spokesperson John Kirby said on Oct. 13 that the US is aware that "Russian nuclear units train extensively at this time of year," even though Russia "probably believes this exercise will help it project power."

Over the course of the war, Putin has issued multiple threats to use nuclear weapons against

any country seen as interfering in Ukraine and, more recently, to protect "the territorial integrity of our motherland...by all the systems available to us." After Russia's claimed annexation of four Ukrainian regions in September, which was roundly condemned worldwide as illegal, the Kremlin stressed its view that an attack in those regions equals an attack on Russia. That assertion gives rise to the possibility that Russia may contemplate using nuclear weapons against Ukraine if the Ukrainian military carries out an attack in those regions.

... Russian Deputy Foreign Minister Sergei Ryabkov attempted to downplay Putin's threats on Sept. 23, claiming that Moscow is "not threatening anyone with nuclear weapons." Yet, a week later, Putin issued another nuclear threat. He argued that the US set a precedent for nuclear use with the 1945 bombings of Hiroshima and Nagasaki, stating "we will defend our land with all the forces and resources we have, and we will do everything we can to ensure the safety of our people."

**The threat of Putin ordering the use of nuclear weapons is more "elevated" now than at any time since the war began. Nevertheless, U.S. and allied intelligence agencies that closely monitor Russian nuclear forces continue to assess that there are no indications of potential imminent Russian nuclear weapons use. The Pentagon has said repeatedly that it sees no need to adjust the U.S. strategic nuclear force posture.**

CNN reported on Sept. 28 that U.S. officials have said that the threat of Putin ordering the use of nuclear weapons is more "elevated" now than at any time since the war began. Nevertheless, U.S. and allied intelligence agencies that closely monitor Russian nuclear forces continue to assess that there are no indications of potential imminent Russian nuclear weapons use. The Pentagon has said repeatedly that it sees no need to adjust the U.S. strategic nuclear force posture. Analysts have suggested that Russia may consider using nuclear weapons in a strike at a Ukrainian military facility or in a "display," such as the detonation of a nuclear weapon over the Black Sea or Arctic Ocean.

U.S. President Biden emphasized the seriousness with which the US and its allies treat Putin's numerous nuclear threats in Oct. 6 remarks. "We have not faced the prospect of Armageddon since [U.S. President John F.] Kennedy and the Cuban missile crisis" in October 1962, Biden said. "We're trying to figure out, what is Putin's off-ramp?" Biden later commented that he does not think that ultimately Putin will call for the use of Russia's nuclear arsenal.

The US and NATO have declined to detail potential responses, whether diplomatic, military, economic, or a combination, to Russian nuclear use. "We have communicated directly, privately, at very high levels to the Kremlin that any use of nuclear weapons will be met with catastrophic consequences for Russia [and] that the United States [and] our allies will respond decisively," U.S. National Security Advisor Jake Sullivan said on Sept. 25. "We have been clear and specific about what that will entail." Sullivan later stressed that the Biden administration maintains its goal "to avoid a direct conflict between nuclear superpowers."

French President Emmanuel Macron dismissed on Oct. 13 the possibility that Paris would order the use of its nuclear weapons in response to a Russian nuclear strike. France's vital national security interests, on which its nuclear doctrine rests, "would not be at stake if there was a nuclear ballistic attack in Ukraine or in the region," Macron said in an interview with TV channel France 2.

Despite the war and the rhetoric, the US and Russia continue to exchange data on their respective nuclear arsenals, as required by the 2010 New START. The most recent exchange took place on Sept. 1, with the information released to the public a month later. According to the exchange, the US has 1,420 strategic nuclear warheads deployed on 659 delivery vehicles, and Russia has 1,549 strategic nuclear warheads deployed on 540 delivery vehicles. The treaty limits are 1,550 for the warheads and 700 for the delivery vehicles.

On-site inspections conducted under New START remain paused since Russia prohibited inspections of its nuclear weapons-related facilities in August. Washington stated in September that the resumption of on-site inspections is a prerequisite for the two countries to negotiate a new arms control arrangement to replace New START, which expires in February 2026. A U.S. State Department spokesperson told *Arms Control Today* on Oct. 18 that "the United States is working with Russia to schedule a session of New START's Bilateral Consultative Commission for the purpose of resuming inspections." The commission is the implementation body of the treaty, intended to serve as a forum in which to discuss any concerns and issues that may arise as the countries carry out treaty activities and procedures.

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*Source: https://www.armscontrol.org/act/2022-11/news/nato-russia-conduct-simultaneous-nuclear-exercises, 03 November 2022.*

## BALLISTIC MISSILE DEFENCE

### INDIA

### How Ballistic Missile Defence Interceptor will Help India Protect its Nuclear Arsenal

India set to be among elite club of nations with an indigenous long-range ballistic missile interceptor, the others include the US, Russia and Israel. India's DRDO successfully completed the phase-II test of its BMD interceptor AD-1. The test was conducted at DRDO's ITR on APJ Abdul Kalam Island in Balasore, Odisha.

Often described as an instrument of deterrence, the BMD is a system to counter ballistic missiles from enemy states. According to a statement issued by the MoD after the test, the sub-systems and the flight of AD-1 met all mission parameters, with the collected data substantiating the mission's success. Defence Minister Rajnath Singh told the MoD that most nations do not have the capability of a missile interceptor with such advanced technologies and that India's is a unique case.

***India's BMD Measures:*** The need to have an advanced missile defence system became apparent to India in the aftermath of the Kargil war with Pakistan. With its hostile neighbour willing to use nuclear-armed ballistic missiles against India, the country's MoD made it a priority to acquire defence missile systems from friendly powers. China's amassment of ballistic missiles has also been a major cause of concern for India's defence establishment.

This eventually led to a $5 billion defence contract with Russia according to which India is currently in the process of procuring five S-400 defence system. In addition to this, India also started investing in indigenous development of such a system which reached a significant milestone last week.

**It is powered by a two-stage solid motor with an indigenously-developed advanced control system, navigation and guidance algorithm for accurate guidance to its target, according to information shared by the MoD. Such a defence system becomes especially significant in case of a war involving nuclear missiles.**

***The Significance of AD-1:*** The AD-1 is an interceptor missile system that is capable of neutralising incoming long-range ballistic missiles as well as aircraft at both low exo-atmospheric and endo-atmospheric levels. It is powered by a two-stage solid motor with an indigenously-developed advanced control system, navigation and guidance algorithm for accurate guidance to its target, according to information shared by the MoD. Such a defence system becomes especially significant in case of a war involving nuclear missiles. "If

one side has a 100% effective ABM, its nuclear arsenal is effectively safe from a pre-emptive or a second strike by the enemy.

Thus, the side with an ABM is incentivised to initiate a conflict, knowing it will be safe from response from enemy weapons remaining after a first strike," says Andrew Green, a London-based defence analyst.

**The use of Ballistic Missile Defence systems is, by and large, viewed as an incentive to stockpile nuclear arms and hence a threat to nuclear disarmament around the world. However, it is gradually becoming a crucial component of 21st century warfare and is already giving rise to a new arms race.**

DRDO chief Dr Samir Kamat says that India now has the capability to intercept missile in the 5,000 km class with the help of AD-1. This places India in an elite club of nations with such air defence capability.

***BMDs Around the World:*** The US has been at the forefront of developing defence systems aimed at intercepting ballistic missiles and other hostile projectiles. Its THAAD system has been operational since 2008. They also have a sea-based interceptor system called Aegis.

The Arrow is a family of missiles used in the Israeli BMD system. It has been operational since 2000 and was jointly developed by the US and Israel. The Russian use of its indigenous S-400 BMD can be witnessed in its ongoing conflict with Ukraine. Several countries have procured the S-400 from Russia including India, China and Turkey.

***BMD: To Use or Not?*** The use of Ballistic Missile Defence systems is, by and large, viewed as an incentive to stockpile nuclear arms and hence a threat to nuclear disarmament around the world. However, it is gradually becoming a crucial component of 21st century warfare and is already giving rise to a new arms race. Andrew Green points out that if one country has an effective missile defence system, then their nuclear arsenal is safe from a pre-emptive strike by their enemy. He summarises the use of BMD with an interesting rhetoric – "Why would I not punch you first? You can't hit me back and I'd therefore win." The question remains whether India, if and when threatened with nuclear war by its neighbours, will resort to such logic.

*Source: Siddhant Hira, https://www. outlookindia. com/business/how-ballistic-missile-defence-interceptor-will-help-india-protect-its-nuclear-arsenal-news-235455, 07 November 2022.*

## INDONESIA

### Indonesia to be First Foreign User of Turkey's Khan Missile System

**Speaking to Turkish media, Roketsan's deputy general manager, Murat Kurtulus, stressed the importance of the Southeast Asian market to the company. "We will soon be putting our first products into the service of the Indonesian Ministry of Defense thanks to the contracts we have signed," Kurtulus said. "These are two different products. The Khan Missile system is the first. This is a significant weapon system with a range of 280 kilometers and high precision in the battlefield's depths. The Indonesian military will be the system's first foreign user.**

Turkish missile-maker Roketsan signed a contract with Indonesia in November, 2022 to supply Khan missiles and a multilayer air defense system for the Asian nation's military. This is the first time the Khan missile system, an export version of the combat-proven Bora ballistic missile system, will enter the inventory of a force other than the Turkish military. The deal was announced at the Indo Defence Expo & Forum, which ran Nov. 2-5. Speaking to Turkish media, Roketsan's deputy general manager, Murat Kurtulus, stressed the importance of the Southeast Asian market to the company. "We will soon be putting our first products into the service of the Indonesian Ministry of Defense thanks to the contracts we have signed," Kurtulus said. "These are two different products. The Khan Missile system is the first. This is a significant weapon system with a range of 280 kilometers and high precision in the battlefield's depths. The Indonesian military will be the system's first foreign user."

Kurtulus also noted the company will develop a tailor-made air defense system for the Indonesian Army. "The second contract is about the layered air defense system. The Indonesian Ministry of Defense had different requirements in this regard. We have created a new model in collaboration with our international business partners. A technical and financial model has been developed. We will present our first layered air defense system products as two separate medium- and long-range systems here. In the coming months, we will also discuss close air defense systems," Kurtulus explained. Roketsan officials did not reveal additional information about the layered air defense system, and the company declined to answer Defense News' inquiries about the contracts' values and delivery timelines. According to Roketsan brochures, the Khan missile can launch from a multi-barrel rocket launcher on an eight-wheel drive vehicle. In accordance with the customer's requirements, it can also launch from other tactical wheeled vehicles.

**It's rumored the Indonesian Navy is interested in Turkey's Atmaca anti-ship missile system, though Roketsan has not confirmed this. However, Kurtulus did not Indonesia's "very large coastlines" and islands, adding that the country "needs naval systems and surface-to-surface guided missiles.**

The 280-kilometer-range (174-mile-range) missile weighs about 2,500 kilograms (5,512 pounds) with a 470-kilogram (1,036-pound) high-explosive warhead. Khan missiles are managed via aerodynamic control with an electromechanical actuation system, and supported with GPS and inertial guidance system technology. It's rumored the Indonesian Navy is interested in Turkey's Atmaca anti-ship missile system, though Roketsan has not confirmed this. However, Kurtulus did not Indonesia's "very large coastlines" and islands, adding that the country "needs naval systems and surface-to-surface guided missiles. We want and hope that we can further develop the cooperation that we signed for the first time at this exhibition in the near future."

*Source: Tayfun Ozberk, https://www.defensenews.com/industry/2022/11/08/indonesia-to-be-first-foreign-user-of-turkeys-khan-missile-system/, 08 November 2022.*

**IRAN**

**Iran Unveils Upgraded Long Range Missile Defence System**

]The Iranian Ministry of Defence unveiled an upgraded version of the Bavar-373 surface-to-air missile defence system with a range of more than 300 kilometres, the Fars news agency reported. The agency said the upgraded Bavar-373 system has been successfully tested against long-range fixed targets. During the test, the Bavar-373 radar detected the target at a distance of more than 450 kilometres and tracked it at a distance of about 405 kilometres before destroying it at a range of over 300 kilometres.

The detection range of the Bavar-373 radar has been increased from 350 to 450 kilometres, and the engagement radar has been increased from 260 to 400 kilometres. The range of the system's missile was also increased from 200 to 300 kilometres, and the height of its engagement was increased from 27 to 32 kilometres, according to the same source. Iranian Defence Minister Mohammad Reza Ashtiani said the system can engage and destroy six targets simultaneously, noting that many countries wish to possess such a defence system.

*Source: https://www.middleeastmonitor.com/20221107-iran-unveils-upgraded-long-range-missile-defence-system/, 07 November 2022.*

## NUCLEAR ENERGY

**EUROPE**

**EU Needs $460 Billion Investment to Maintain Nuclear Power Capacity**

The European Union will need up to $462 billion (450 billion euros) in investment just to keep the current level of its nuclear power generation capacity, the EU Commissioner for Energy, Kadri Simson, said at a nuclear energy forum. Nuclear power will have an important role to play in the EU's climate targets of low-carbon electricity

generation, Simson said at the European Nuclear Energy Forum in Prague. "The backbone of the future European carbon free power system will be predominantly renewables. But the reality is that these renewables will need to be complemented with a stable baseload electricity production. This is why nuclear energy is not just a safety and security concern, but also a real solution," she added.

This year, a year when surging energy prices have highlighted the importance of energy security, the EU is particularly focused on its nuclear power availability. According to the EU modeling, nuclear power generation will account for around 15%-16% of the EU's power output in 2030 and 2050, Simson said. The EU needs a stable generation capacity, at the level of just over 100 GW, in the coming decades. Yet, a lot of investment will be needed to keep that generation capacity in the future. "Our analysis shows that without immediate investment, around 90% of existing reactors would be shut down around the time when we need them most – in 2030," Simson noted.

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**The EU will need between $360 billion (350 billion euros) and $462 billion (450 billion euros) of investment just to maintain the current generation capacity, and another up to $51.3 billion (50 billion euros) in the long-term operation of existing reactors, according to the EU commissioner.**

The EU will need between $360 billion (350 billion euros) and $462 billion (450 billion euros) of investment just to maintain the current generation capacity, and another up to $51.3 billion (50 billion euros) in the long-term operation of existing reactors, according to the EU commissioner. New technology, such as SMRs, could be the solution to integrate the energy system and decarbonize the sectors that pose the biggest challenge, said Simson, adding that the EU aims to have the first European SMRs go live in the early 2030s.

*Source: Tsvetana Paraskova, https://oilprice.com/Latest-Energy-News/World-News/EU-Needs-460-Billion-Investment-To-Maintain-Nuclear-Power-Capacity.html, 11 November 2022.*

## GERMANY

### German Parliament Approves Nuclear Plants Life Extension

Lawmakers in the German Bundestag voted in favor of keeping Germany's three remaining nuclear plants in operation until April. Germany had planned to complete a phaseout of nuclear power by the end of 2022. But Chancellor Olaf Scholz ordered the extension in October amid looming energy shortages in light of Russia's invasion of Ukraine.

Lawmakers were voting on changing Germany's Atomic Energy Law, which is the legal framework of the extension. The revisions clearly stipulate that there will be no new extension beyond April. Environment Minister Steffi Lemke told broadcaster RTL that the law "clearly states that the shutdown will take place on April 15."

The nuclear power plants are Isar 2 in the southern state of Bavaria, Emsland in northwestern Germany and Neckarwestheim 2 in the southwestern Baden-Württemberg state. According to German broadcaster ZDF, the draft law stipulated that "the safety of the [nuclear] systems is continuously ensured at a high level by comprehensive state supervision." However, an extensive periodic safety review, typically carried out every 10 years, would not be run on the three plants due to "the extremely short period of continued operation," ZDF reported, citing the draft law.

Why is the extension controversial? The nuclear power lifespan extension triggered an intense debate within Germany's coalition government. Scholz's decision is seen as a compromise

between the demands of his coalition partners, the Greens and the business-friendly FDP. The FDP is pushing to keep the reactors active until 2024. But the Greens have long opposed nuclear energy, and their party was partly built on post-war anti-nuclear movements. While admitting it was difficult to support the extension, the Greens ended up giving it their backing under the condition that it is temporary.

*Source: https://www.dw.com/en/german-parliament-approves-nuclear-plants-life-extension/a-63721032, 11 November 2022.*

**INDIA**

**'India a Platform for New Nuclear Technologies... I See a Very Bright Future': IAEA Chief Rafael Mariano Grossi**

In an interview with *The Indian Express* at COP27, Grossi spoke about the current situation in Ukraine where a large nuclear power plant has been turned into one of the riskiest battlefields, why many countries were still opting for nuclear energy, and how nuclear energy was integral to any clean energy transition.

**The construction of a nuclear power plant in Poland "is a huge undertaking that serves us greatly economically." He added that 70 percent of the work on the plant will be done by Polish companies. The Polish government approved a resolution on building large-scale nuclear power plants in Poland confirming the selection of Westinghouse as the technology provider for the first Polish nuclear power plant, with an AP1000 reactor.**

At a time when the risks of a nuclear accident, even a war, are at an unprecedented level, the IAEA, the global industry regulator, has made an appearance at the climate change conference for the first time, underlining the sector's key role in effecting a quick transition away from fossil fuel-based energy sources. At COP27, IAEA director general Rafael Mariano Grossi has been pitching nuclear energy as part of the solution to the climate crisis, not a problem itself. The nuclear industry, however, has faced huge opposition from a section of climate activists at previous climate change meetings, citing the risks and the costs.

*Source: Amitabh Sinha, https://indianexpress.com/article/india/india-platform-for-new-nuclear-technologies-see-bright-future-iaea-chief-rafael-mariano-grossi-8266883/, 14 November 2022.*

**POLAND**

**Nuclear Power to Account for Up to 35 Percent of Energy Mix**

Nuclear power will ultimately make up 30-35 percent of Poland's energy mix while the rest will mostly come from the renewable energy sources, the development and technology minister has said. Waldemar Buda told the Republika TV station on 08 November that "in 10-12 years our energy mix will look completely different from today." "A nuclear power plant will form the basis of the energy mix... and nuclear power will constitute 30-35 percent," he said, adding that it is "the most stable and cheapest" source of energy.

Buda added that renewables, "the cheapest sources of energy," will form "a large part" of Poland's energy mix, and that "this is our target model. "If we are talking about the perspective of 10-15 years, we have to be sure that no external crises, such as the energy resources crises today, will disturb the market to the extent that the prices will rise four times... as happened during the summer holidays." According to Buda, the construction of a nuclear power plant in Poland "is a huge undertaking that serves us greatly economically." He added that 70 percent of the work on the plant will be done by Polish companies. The Polish government approved a resolution on building large-scale nuclear power plants in Poland confirming the selection of Westinghouse as the technology provider for the first Polish nuclear power plant, with an AP1000 reactor. The first reactor should start working in 2033, generating some 1-1.6 GW of power. Subsequent reactors would be constructed every two years.

*Source: https://www.thefirstnews.com/article/nuclear-power-to-account-for-up-to-35-pct-of-*

*energy-mix-minister-says-34268, 08 November 2022.*

**Poland Gives Details on $20B Nuclear Power Bid**

Westinghouse of the US gets the nod to build the country's first nuclear power plant. U.S. nuclear power technology provider Westinghouse will build Poland's first reactor by 2033, Prime Minister Mateusz Morawiecki said.... "We assume the overall cost at around $20 billion," he told reporters, adding: "The upfront capital investment is big but once a nuclear power plant is operational, the cost of generating electricity is relatively low."

**Poland is looking at nuclear power to reduce its dependence on coal, which still accounts for around 70 percent of the country's energy mix. That also dovetails with an effort to end reliance on Russian coal, oil and gas.**

Poland is looking at nuclear power to reduce its dependence on coal, which still accounts for around 70 percent of the country's energy mix. That also dovetails with an effort to end reliance on Russian coal, oil and gas. ... Poland is one of the few countries in Central Europe with no nuclear power sector; an effort to build a power plant in the 1980s was thwarted by the 1986 Chernobyl disaster and by Poland's financial woes.

Warsaw's nuclear plans are ambitious. The official strategy assumes building six reactors in two locations by the mid-2040s but Morawiecki said a third location is not out of the question. On top of the government program with Westinghouse, there is a parallel business-led effort with South Korea. Poland's utilities ZE PAK and PGE signed a letter of intent Monday with Korean company KHNP to analyze a power plant that would be built in central Poland. The Westinghouse power plant will be built in Choczewo on Poland's Baltic Sea cost, around 80 kilometers northwest of Gdañsk. The exact location will be pinpointed once the project secures an environmental permit, Climate and Environment Minister Anna Moskwa told the same briefing. The goal is to begin construction by 2026 and to start operations in 2033.

...The three bidders for nuclear projects in Poland were Westinghouse, KHNP and France's EDF. Poland also plans to develop offshore wind power in the Baltic Sea as well as onshore wind, solar power and biomass — potentially cutting coal's share in the country's energy mix to an estimated 11 percent to 28 percent, according to the country's energy transition strategy.

*Source: https://www.politico.eu/article/poland-20-billion-nuclear-power-us-westinghouse/, 02 November 2022.*

**RUSSIA**

**Russia Maintains Grip on Global Nuclear Energy Landscape**

Faced with a global energy crisis and a race to slash emissions, advanced economies are starting to reconsider nuclear power after a period of declining investment. The incentive is all the greater among European countries, which are urgently seeking to move away from Russian fossil fuels to starve the Kremlin of funds for its assault on Ukraine. But an atomic shift does not necessarily free a country from energy dependence on Russia, given the scale of the country's presence in the nuclear sector.

**There were 437 operational reactors around the world as of 2021 excluding those suspended, according to the IAEA. About 10 per cent or 42 reactors outside of Russia were using Soviet-designed VVER technology, with others using designs from countries including the US, Canada, Germany and France. Ukraine has by far the largest number of VVER fleets outside Russia, with all 15 of its operating reactors using the technology, with the Czech Republic next on six.**

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largest number of VVER fleets outside Russia, with all 15 of its operating reactors using the technology, with the Czech Republic next on six.

Similarly, of the 52 reactors currently being built around the world excluding Russia, 21 use VVER. China, India and Turkey have the largest number with 4 each, with countries like Bangladesh, Egypt and Iran also taking in Russian technology. The prevalence of Russian-designed reactors currently being built is in part a matter of timing, according to Jonathan Cobb, analyst at the World Nuclear Association, who said "the Russian reactor programme itself was very active" over the past decade when many of the contracts for these projects were signed. "It's comparable to looking back into the 70s and 80s. Westinghouse was a particularly active constructor in the US, and that led to the adoption of its technology more broadly worldwide," he added.

...Russia was also the seventh-largest producer of uranium in 2021. State-owned Rosatom accounts for about 40 per cent of the world's uranium enrichment capacity, making it a crucial supplier as most nuclear power stations use enriched fuel.

**This is the first bilateral agreement for peaceful nuclear cooperation between the United States and Mexico. The Agreement builds on the nearly 80 years of peaceful nuclear cooperation between our two countries and establishes the conditions for continued U.S. civil nuclear trade with Mexico.**

China is also increasing its exports of nuclear technology. With 27 of the 31 reactor construction projects started since 2017 of Russian or Chinese design, according to the International Energy Agency, battle lines are being drawn with the US.

In 2020, Romania ended six years of talks with China on the construction of two nuclear reactors and signed co-operation and financing agreements with the US, while the Czech Republic excluded Russian and Chinese companies from the tender to build a new reactor at its Dukovany nuclear plant on security grounds.

Poland last month awarded a contract to build its first nuclear plant to US group Westinghouse Electric. ...The country also signed outline agreements with South Korea days after the US deal to assess the viability of building four reactors in central Poland. For nuclear exporting nations such as the US, South Korea and France to compete with China and Russia, "there is a need for a way of finding how importing countries are able to secure the finance for the deals," said Cobb of the World Nuclear Association. According to the body, there are about 30 countries that are considering, planning or starting new nuclear power programmes. ...

*Source: Shotaro Tani, https://www.ft.com/content/ffe76530-8fcb-45c3-aade-dc307af9c82f, 12 November 2022.*

## NUCLEAR COOPERATION

### FRANCE–UK

### France's Macron and UK's Sunak Agree Nuclear Energy Cooperation

French President Emmanuel Macron and Britain's Prime Minister Rishi Sunak on 7 November pledged "ambitious cooperation" in the field of nuclear energy to cope with the impact on energy supplies of Russia's invasion of Ukraine. The two leaders met on the sidelines of climate talks in Egypt, their first meeting since Sunak became prime minister.

*Source: https://www.reuters.com/business/energy/frances-macron-uks-sunak-agree-nuclear-energy-cooperation-2022-11-07/, 08 November 2022.*

### USA–MEXICO

### U.S.-Mexico Civil Nuclear Cooperation Agreement Enters into Force

Today (3 Nov), the United States and Mexico's Agreement for Cooperation in Peaceful Uses of Nuclear Energy entered into force. The agreement will enhance our cooperation on energy security and strengthen our diplomatic and economic relationship. This is the first bilateral agreement for peaceful nuclear cooperation between the United States and Mexico. The Agreement builds on the nearly 80 years of peaceful nuclear

cooperation between our two countries and establishes the conditions for continued U.S. civil nuclear trade with Mexico.

... This agreement provides a comprehensive framework for peaceful nuclear cooperation with Mexico based on a mutual commitment to nuclear nonproliferation. It will permit the transfer of nuclear material, equipment (including reactors), components, and information for nuclear research and nuclear power production.

*Source: https://www.state.gov/u-s-mexico-civil-nuclear-cooperation-agreement-enters-into-force/, 03 November 2022.*

## URANIUM PRODUCTION

### USA

### US Developing Domestic Uranium Strategy

The US is working on supplying its own uranium for existing and advanced nuclear reactors that could become commercial in the future to reduce dependency on Russia for the fuel, Jennifer Granholm, the US energy secretary told reporters on 27 October.

**The US relies on Russia and its allies Kazakhstan and Uzbekistan for roughly half of the uranium powering its nuclear power plants. The administration of President Biden has banned imports of Russian petroleum over Moscow's invasion of Ukraine, but has not banned its uranium.**

.The US relies on Russia and its allies Kazakhstan and Uzbekistan for roughly half of the uranium powering its nuclear power plants. The administration of President Biden has banned imports of Russian petroleum over Moscow's invasion of Ukraine, but has not banned its uranium. Biden in August signed the Inflation Reduction Act, which contained $700 million for producing a supply of high assay low enriched uranium (HALEU) that many advanced reactors being developed plan to use. In addition, the administration in March invoked the Cold War-era Defense Production Act to support production and processing of critical minerals. ...

In September, the White House asked Congress for another $1.5 billion in a temporary government funding bill to boost domestic supply of low enriched uranium and HALEU. The measure was not attached to the annual defense spending bill as some lawmakers had concerns about costs. But Granholm said the administration is "seeking an additional large amount by the year end for a more fulsome strategy." The Department of Energy has supplies of heavily enriched uranium, from which it can down blend fuel for reactors. Some nuclear power proponents also want to boost US mining and processing of uranium, practices many environmentalists want to limit.

*Source: https://www.mining.com/web/us-developing-domestic-uranium-strategy-energy-secretary/, 27 October 2022.*

## NUCLEAR PROLIFERATION

### AUSTRALIA

### Australia Sets New Defense Course to Establish Nuclear Submarines Fleet

Australia has set the course of its next defense strategy, which includes the development of nuclear-powered submarines to repel attacks far from the country's shores, Australian Defense Minister Richard Marles said on 08 November 2022. "Increasingly, we are going to need to think about our Defence Force in terms of being able to provide the country with impactful projection, meaning an ability to hold an adversary at risk much further from our shores across the full spectrum of proportionate response," Marles said, delivering a speech at a university in Canberra, as quoted by the *Australian Financial Review* newspaper. The minister also said that the new defense strategy relies on the establishment of a submarine fleet in cooperation with the US and the UK within the AUKUS trilateral partnership.

Australia, the US, and the UK announced the AUKUS defense partnership in September 2021. The first initiative announced under the AUKUS pact was the development of nuclear-powered submarine technology for the Royal Australian Navy, which prompted the Australian government

to abandon a $66 billion agreement with France's Naval Group Company for the construction of diesel-electric submarines. Earlier, the *Wall Street Journal* had reported that the Biden administration is in the middle of discussions to expedite the construction of Australia's first nuclear-powered submarines as guaranteed in the AUKUS defense pact. The report said..., citing Western officials that the US wants to build the first several nuclear-powered submarines for Australia and provide it with a submarine fleet by the mid-2030s in response to China's growing military power.

The US' recommendation has not yet been formally approved, but a final decision on this matter is expected in March, the report said. The report also highlighted the challenges the United States would face to complete the task, including the need to secure billions of dollars to expand its submarine-production capacity and a contribution from Australia to back the effort. The White House said in a press release that Australia, the UK, and the US – the countries that comprise the AUKUS security pact – have made significant progress toward ensuring that Australia would acquire conventionally armed, nuclear-powered submarines. The AUKUS allies will provide the submarines at the earliest possible date, the release said.

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In September, the three allies announced the new trilateral security partnership, forcing Australia to abandon its $66 billion contract with France to receive 12 state-of-the-art conventionally-powered attack submarines from the US. In May, the Chinese Foreign Ministry said the AUKUS security pact is provoking an arms race in the South Pacific without any consultation with island countries of the region. China believes that the AUKUS partnership escalates the arms race in the region and urges the US, the UK, and Australia to commit to the non-proliferation of nuclear weapons, Chinese Defense Ministry spokesman Tan Kefei had said earlier. ...

**In May, the Chinese Foreign Ministry said the AUKUS security pact is provoking an arms race in the South Pacific without any consultation with island countries of the region. China believes that the AUKUS partnership escalates the arms race in the region and urges the US, the UK, and Australia to commit to the non-proliferation of nuclear weapons.**

*Source: https://eurasiantimes.com/australia-sets-new-defense-course-to-establish-nuclear-submarines/, 08 November 2022.*

**IRAN**

**Iran Expands Nuclear Program amid Protests**

Iran announced steps to further expand its nuclear program as talks with the US to restore the 2015 nuclear deal remain at an impasse that is likely to persist given the protests in Iran. In an October 10 report, the IAEA noted that Iran informed the agency of its plans to install an additional three cascades of IR-2 centrifuges, which are used to enrich uranium. The report also confirmed that Iran had completed the installation of six cascades of IR-2 centrifuges and one cascade of IR-4 centrifuges since the last IAEA report was issued on Sept. 7. The IR-2 and IR-4 centrifuges enrich uranium more efficiently than Iran's IR-1 model, which Tehran is limited to using to produce enriched uranium under the nuclear deal, known as the JCPOA, until 2026.

Once operational, these more advanced machines will further expand Iran's uranium-enrichment capacity, which is already greater than at any point in the country's history. If negotiations resume, there is a risk that the US will determine that Iran's advancing nuclear program has undercut the non-proliferation benefits of the JCPOA. In such case, Washington may conclude that it is no longer

worth the political price to lift sanctions as the deal requires and will abandon efforts to resurrect the accord. The Biden administration is also taking action to increase pressure on Iran while negotiations remain stalled, including new sanctions targeting Iran's petrochemical sector announced in October.

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Although Iran and the US continue to express support for restoring the deal, domestic politics make this increasingly challenging. The Raisi government is facing widespread protests in Iran after a young woman, Mahsa Amini, died in the hospital in September after being beaten by police for not adhering to the country's strict dress code for women. Tehran has accused foreign powers of instigating the protests. Iranian Foreign Ministry spokesman Nasser Kananni said on Oct. 10 that the United States and Europe are linking the negotiations on the JCPOA to "recent issues in Iran." Iran will not allow any country to meddle in its internal affairs, he said. It is unclear what linkages Kananni was referencing, given that talks on the JCPOA remain stalled. U.S. officials have said Washington can support the protestors and a nuclear deal at the same time, but it would be politically more difficult for the Europeans and the United States to reach an agreement with Iran while the government in Tehran is violently suppressing the protests, particularly before the U.S. midterm elections on Nov. 8.

**If JCPOA talks resume, a deal is far from certain. A major issue preventing agreement is Iran's demands that the IAEA close its investigation into undeclared nuclear materials and activities from the pre-2003 period within a specific time frame and to refrain from further investigations.**

In an Oct. 14 speech, U.S. President Biden said that the US stands "with the citizens, the brave women of Iran…who are demonstrating to secure their very basic, fundamental rights." Two days earlier, State Department spokesperson Ned Price said that the nuclear talks are "not our focus right now" and that the Biden administration is prioritizing "shining a spotlight" on the protestors. The administration also has lifted some sanctions, such as measures that restricted access to the internet and communications technologies, which officials say will support the protestors. Even after the elections, the U.S. political will may not exist to restore the nuclear agreement with Iran because of the protests. "The Europeans had already lost their patience for dealing with Iran, and now we've lost our appetite" even though a deal "would still yield important non-proliferation benefits," an official from a European country that is a party to the deal said on Oct. 13. The Biden administration is also under pressure not to reach an agreement with Iran at this time, given that a restored JCPOA would allow the Iranian government to access frozen assets and benefit from sanctions relief.

In addition to voicing support for the protestors, the EU and the US imposed sanctions on Iranian individuals and entities involved in the crackdown. The EU also passed sanctions over Iran's sale of drones to Russia. Russia has used these drones in its war against Ukraine, including attacks on civilians.

French Foreign Ministry spokesperson Anne-Claire Legendre told reporters in an Oct. 13 press briefing that the use of drones to bombard civilian targets "likely constitute war crimes" and violates UN Security Council Resolution 2231. Under that resolution, Iran is prohibited from exporting missile systems or unmanned aerial vehicles, such as drones, that are capable of delivering a weapon of mass destruction. That threshold is defined as carrying a 500-kilogram payload a distance of more than 300 kilometers. If JCPOA talks resume, a deal is far from certain. A major issue preventing agreement is Iran's demands that the IAEA close its investigation into undeclared nuclear materials and activities from the pre-2003 period within a specific time frame and to refrain from further investigations.

The US has made clear that it will not tie the IAEA's hands, but will support closing the investigation when the agency is satisfied that Iran has cooperated with its inquiries. Mohammad Eslami, head of the Atomic Energy Organization of Iran, met IAEA Director-General Rafael Mariano Grossi on Sept. 26 to resume talks over how to address the agency's investigation, which has remained stalled since May. Tweets from Iranian Foreign Minister Hossein Amirabdollahian suggested that the two sides had agreed on a path forward for resolving the safeguards investigation, but the IAEA made no similar statement. Grossi confirmed that the meeting took place, but said only that there is a lot of work ahead to reach a conclusion.

Even if the IAEA issue can be resolved, the US is concerned that if talks resume, Iran may raise new demands or attempt to reopen closed issues, as it has in the past. Robert Malley, U.S. special envoy for Iran, told NPR on Oct. 7 that all other parties agreed to a deal to restore the JCPOA in March and then again in August. But each time, he said, Iran countered with "some new demands, most of the time either an unrealistic demand or one that was extraneous to the nuclear talks, something that had nothing to do with it."

*Source: Kelsey Davenport, https://www.armscontrol.org/act/2022-11/news/iran-expands-nuclear-program-amid-protests, 03 November 2022.*

## NUCLEAR NON-PROLIFERATION

### GENERAL

### IAEA Launches New Reference Publication for Nuclear Safeguards

How do IAEA safeguards help curb the spread of nuclear weapons? What are the different activities that IAEA inspectors conduct at nuclear facilities? What are undeclared nuclear materials and activities? Answers to these questions and more can be found in the new edition of the IAEA's Safeguards Glossary, a reference book released that explains the specific terminology related to safeguards in an accessible way. The Glossary ensures safeguards practitioners are 'on the same page', use the same definitions, and can therefore work together more efficiently.

Safeguards are a set of technical measures to verify that countries use nuclear material only for peaceful purposes. However, the myriad of verification activities performed by IAEA experts is not always easy to understand. ...

**Safeguards make a vital contribution to international peace and security. Through the activities defined in the glossary, IAEA inspectors verify that countries are complying with their international nuclear non-proliferation obligations. Such activities include on-site visits, applying containment and surveillance, satellite imagery analysis, and nuclear material and environmental sampling.**

The IAEA published the first Safeguards Glossary in 1980 to expound the specialised terminology, and to help establish a common set of terms across all safeguards stakeholders. The new edition, updated and revised for the first time since 2001, contains a collection of terms, carefully defined by multidisciplinary experts that are relevant to IAEA verification processes. It includes definitions, detailed explanations and examples, and encompasses extensive areas of safeguards work. The list of terms is translated into Arabic, Chinese, French, German, Japanese, Russian and Spanish.

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Over the past two decades, the implementation of IAEA safeguards has evolved in line with technology, becoming increasingly sophisticated, advanced and better equipped. An increasing number of countries — now totalling 187 — have safeguards agreements in force. Likewise, the amount of nuclear material and the number of nuclear facilities around the world are steadily growing. The new edition of the Safeguards Glossary reflects all these changes and introduces terms that have come into use over the last 20 years. The terms are grouped into chapters — each focused on a specific topic — from concluding safeguards agreements and measuring nuclear materials, to carrying out in-field inspections and drawing safeguards conclusions. The IAEA offers substantial support to countries to promote effective cooperation and facilitate the efficient application of safeguards. It provides written materials — such as the new glossary — as well as guidance documents, training courses and other resources.

*Source: Artem Vlasov, https://www.iaea.org/newscenter/news/iaea-launches-new-reference-publication-for-nuclear-safeguards, 05 November 2022.*

**USA**

## Global Nuclear Threats Tracked by Artificial Intelligence

US government research is developing artificial intelligence technologies which will allow agencies to track "malicious actors" looking to circumvent international nuclear non-proliferation safeguards. New research from Pacific Northwest National Laboratory (PNNL) uses machine learning, data analytics, and artificial reasoning to make threat detection and forensic analysis in the nuclear domain easier and faster, say researchers.

**US government research is developing artificial intelligence technologies which will allow agencies to track "malicious actors" looking to circumvent international nuclear non-proliferation safeguards. New research from Pacific Northwest National Laboratory (PNNL) uses machine learning, data analytics, and artificial reasoning to make threat detection and forensic analysis in the nuclear domain easier and faster.**

Agencies including IAEA currently employ monitoring techniques to ensure nuclear materials subject to agreements are not used to produce nuclear weapons, and forensics methods to determine the origin of nuclear materials recovered by law enforcement, but these techniques are often time and labour-intensive. ... With support from the NNSA, the Mathematics for Artificial Reasoning in Science (MARS) Initiative, and the Department of Defense, PNNL researchers are working on several projects to make nuclear non-proliferation and safeguards more effective.

***Artificial Intelligence Helps Answer Nuclear Questions:*** In a study published in The International Journal of Nuclear Safeguards and Non-Proliferation, Wilson worked with researchers from Sandia National Laboratories to build a virtual replica of a reprocessing facility. They then trained a machine learning model to detect process data patterns representing the diversion of nuclear materials. In this simulated environment, the model showed encouraging results. ...PNNL data scientists Megha Subramanian and Alejandro Zuniga along with Benjamin Wilson, Kayla Duskin and Rustam Goychayev are working to make this task easier through research which was featured in The International Journal of Nuclear Safeguards and Non-Proliferation. "We wanted to create a way for researchers to ask nuclear domain-specific questions and receive correct answers," says Subramanian.

PNNL researchers, in collaboration with the University of Utah, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory, developed a way to use machine learning to aid in the forensic analysis of nuclear samples. Their method uses electron microscopy images to compare microstructures as samples

contain subtle differences that can be identified using machine learning.

*Source: George Hopkin, https://technologymagazine.com/articles/global-nuclear-threats-tracked-by-artificial-intelligence, 07 November 2022.*

## NUCLEAR DISARMAMENT

### JAPAN

### Adoption of the Draft Resolution on the Elimination of Nuclear Weapons Submitted by Japan to the First Committee of the UNGA

1. On October 31, the draft resolution entitled "Steps to building a common roadmap towards a world without nuclear weapons," submitted by the Government of Japan to the First Committee of the UN General Assembly in New York, was adopted with the support of 139 countries. The draft resolution is scheduled to be considered in a plenary meeting of the UN General Assembly in early December.

2. Taking into consideration the discussions at the Tenth NPT Review Conference held this August, the Government of Japan is cognizant of the need to present a way forward for realistic and practical measures to realize a world without nuclear weapons. To this end, the Government of Japan has submitted this resolution which is based on the "Hiroshima Action Plan" proposed by Prime Minister KISHIDA Fumio at the aforementioned conference, and which calls on the importance of continuing the record of non-use of nuclear weapons, enhancing transparency as well as disarmament and non-proliferation education that fosters the accurate understanding on the realities of nuclear weapons use.

3. In the light of the widening division within the international community over approaches on nuclear disarmament, it is significant that this draft resolution was adopted with support from states with various positions including nuclear weapon states such as the United States of America, the United Kingdom and France.

4. Through this draft resolution, Japan will work to enhance the momentum of the international community to achieve a world without nuclear weapons and steadily advance realistic and practical efforts, bearing in mind that the G7 Summit will be held in Hiroshima next year.

*Source: Statement by Foreign Minister HAYASHI Yoshimasa. https://www.mofa.go.jp/press/release/press3e_000490.html, 01 November 2022.*

**The US and Russia have agreed to hold talks on the single existing nuclear treaty between the two countries in the near future, State Department spokesperson Ned Price said on 08 November. The New START treaty limits all deployed intercontinental-range nuclear weapons by Russia and the US.**

### USA–RUSSIA

### US and Russia Agree to Hold Talks on Nuclear Treaty for First Time Since Ukraine war Began

The US and Russia have agreed to hold talks on the single existing nuclear treaty between the two countries in the near future, State Department spokesperson Ned Price said on 08 November. The New START treaty limits all deployed intercontinental-range nuclear weapons by Russia and the US. The treaty – the only one left regulating the two largest nuclear arsenals in the world – was extended by five years in February 2021 during the first weeks of Joe Biden's presidency. It requires both countries to allow on-site inspections of its nuclear weapons-related facilities by the other. Those inspections were paused in March 2020 due to the COVID-19 pandemic. A resumption of the inspections is expected to be a topic of discussion at the upcoming meetings, US officials said.

Diplomatic relations between Russia and the US are in the doldrums following Russian President Putin's decision to invade Ukraine with no end to the war in sight but US officials have viewed it as a positive development that Moscow has continued to express interest in the treaty, despite

Putin's alarming nuclear threats as the conflict rages on. Russia has expressed a willingness to discuss extending the treaty and the US has said that negotiations would only happen once the on-site inspections resume.

Complications arose earlier this year after the US attempted to resume the inspections, but Russia rebuffed the efforts, citing alleged efforts by the US to "deprive the Russian Federation of the right to conduct inspections on American territory." Price said at the time that the "US sanctions and restrictive measures imposed as a result of Russia's war against Ukraine are fully compatible" with the New START treaty.

The treaty's meetings occur under the title of the bilateral consultative commission, the BCC.

"We have agreed that the BCC will meet in the near future under the terms of the New START treaty. The work of the BCC is confidential but we do hope for a constructive session," Price said. The last time a BCC was convened was more than a year ago in October 2021. The treaty limits both nations to deploying 1,550 nuclear warheads on delivery systems, including intercontinental ballistic missiles, submarine-launched ballistic missiles, and bombers. CNN reported that Russian military officials have discussed how and under what conditions Russia would use a tactical nuclear weapon on the battlefield in Ukraine, according to a US intelligence assessment described to CNN by multiple sources who have read it.

**CNN reported that Russian military officials have discussed how and under what conditions Russia would use a tactical nuclear weapon on the battlefield in Ukraine, according to a US intelligence assessment described to CNN by multiple sources who have read it.**

The assessment, drafted by the National Intelligence Council, is not a high-confidence product and is not raw intelligence but rather analysis, multiple people who have read it told CNN. For that reason, some officials believe the conversations reflected in the document may have been taken out of context, and do not necessarily indicate that Russia is preparing to use a nuclear weapon. The US has still not seen any signs that Putin has decided to take the drastic step of using one, officials said, and Putin is not believed to have been involved in the discussions described in the intelligence assessment.

*Source: https://www.fbcnews.com.fj/world/us-and-russia-agree-to-hold-talks-on-nuclear-treaty-for-first-time-since-ukraine-war-began/, 09 November 2022.*

## NUCLEAR SAFETY

### SOUTH KOREA

### S. Korea's Nuclear Regulator Keen to Share Knowledge Along with Plant Exports

South Korea's top nuclear regulator sees an important role in sharing their safety knowledge along with the plants it is exporting as Europe and Asia revisit nuclear power to meet carbon emissions goals and ensure energy security. Since President Yoon Suk-yeol took office in May, South Korea - with 24 operating reactors and decades of nuclear power experience since 1978 - has heightened efforts to export nuclear plants. Since August, the country has won contracts to potentially build up to eight nuclear power plants in Egypt and Poland. With those technology exports comes a responsibility to help the countries develop the regulatory and safety rules to operate them, Nuclear Safety and Security Commission Chairperson Yoo Guk-hee told Reuters.

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"The highest priority of all nuclear facilities is

safety, so regulatory techniques become very important," Yoo said in an interview.... In August, South Korea was awarded a 3 trillion won ($2.12 billion) order to help build four nuclear plants in Egypt. Seoul and Warsaw signed agreements to assess the viability of building four 1,400-megawatt nuclear reactors in Patnow, Poland, using South Korean technology. They are the first major export agreements South Korea's nuclear industry has won since a $40 billion order from UAE in 2009 to build four nuclear plants. Since the 2009 deal, the regulator has been working with UAE authorities to pass on regulatory techniques. As an example of how South Korea can help pass along regulatory knowledge, Yoo described how the regulator scientifically finds the proper flow rate for pumps that operate in the plant, then the plant operator designs the pump to that specification, which the regulator then checks for proper function. "Such regulatory techniques are forwarded to the other country, as well as forms and processes. We also dispatch our experts to help support on the ground," Yoo said.

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**South Korea has also outlined plans to increase nuclear power's share in its energy mix to 33% by 2030 from 27% currently, planning an additional six nuclear plants by 2036 on top of the current 24, in a country the size of the U.S. state of Indiana.**

SMR Rules: For a new form of nuclear power technology called SMR, Yoo said nuclear regulators are increasingly drawing up in advance the rules SMR developers need to follow, as around 20 countries are developing about 70 to 80 different forms of SMR. South Korea has also outlined plans to increase nuclear power's share in its energy mix to 33% by 2030 from 27% currently, planning an additional six nuclear plants by 2036 on top of the current 24, in a country the size of the U.S. state of Indiana.

*Source: Joyce Lee, https://www.reuters.com/world/asia-pacific/skoreas-nuclear-regulator-keen-share-knowledge-along-with-plant-exports-2022-11-02/, 02 November 2022.*

## NUCLEAR WASTE MANAGEMENT

### BELARUS

### Russian Practices in Belarus' Draft Radioactive Waste Management Strategy

Russian experience was taken into account in the course of drafting Belarus' radioactive waste management strategy. Head of the Nuclear and Radiation Safety Department of the Belarusian Emergencies Ministry (Gosatomnadzor) Olga Lugovskaya mentioned it during a conference held to discuss the draft strategy....

In line with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management the state is fully responsible for these matters. Every country takes measures to ensure reliable protection from radiological risks and other risks at all stages of management of radioactive waste. A presidential decree stipulated additional tasks in this area, including tasks for Gosatomnadzor. Developing a radioactive waste management strategy was one of the main tasks.

The draft radioactive waste management strategy has implemented fundamental principles of the IAEA that ensure safety in the course of handling of radioactive waste. The legislation stipulates it is necessary to arrange public hearings about the documents that may potentially affect ecological safety. The procedure with regard to the draft radioactive waste management strategy began on 5 October. The document was published by the

national legal information registry and by the Gosatomnadzor website within one month. "Everyone was able to get familiar with it and ask questions. The final stage of the public hearings is now," the official said.

A meeting took place in Minsk on 4 November to discuss the draft radioactive waste management strategy. The event gathered representatives of the Nuclear and Radiation Safety Department of the Belarusian Emergencies Ministry (Gosatomnadzor), the Energy Ministry, the Natural Resources and Environmental Protection Ministry, the Healthcare Ministry, the National Academy of Sciences of Belarus, the Belarusian National Technical University, the International Sakharov Environmental Institute of the Belarusian State University. Citizens and legal persons concerned were also invited to participate. Olga Lugovskaya noted that answers will be given to all the questions, all the remarks will be looked into. "Discussions are proceeding with active participation of the general public. They are supposed to result in a polished draft that takes into account all the remarks and proposals," she said.

*Source: https://eng.belta.by/society/view/russian-practices-in-belarus-draft-radioactive-waste-management-strategy-154433-2022/, 04 November 2022.*

**SWEDEN**

### Swedish Interim Radwaste Storage Facility Opens

A new interim storage facility for low- and intermediate-level radioactive waste has begun operating in Studsvik near Nyköping, Sweden. The facility will initially be used for the storage of waste from the decommissioning of the Ågesta nuclear power plant near Stockholm and the R2 research reactor in Studsvik. The storage facility measures about 27 metres by 90 metres, is 20 metres high and has the capacity to store up to 10,000 cubic metres of waste. It features a 90cm-thick concrete base plate which has been piled with 482 steel rebars that have been anchored in the bedrock. The facility will be owned and operated by Vattenfall subsidiary SVAFO. It took two years to construct at a cost of SEK141 million (USD13 million), which was according to schedule and approximately SEK30 million less than budgeted, Vattenfall noted.

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After going through a test programme, during which it was checked that various installations such as handling and monitoring systems work as they should; the storage facility has now been put into operation. Following extensive preliminary studies of intermediate storage facilities in Sweden and internationally, Svafo concluded that a solid but structurally simple construction in partially prefabricated reinforced concrete best served the purpose. Since the facility will contain radioactive waste, the construction was subject to strict regulations from the Land and Environmental Court and the Radiation Safety Authority. In the construction permit from the municipality of Nyköping, there were additional rules and SVAFO had its own high requirements for its implementation.

"We do not see the strict requirements as a limitation, but rather as an asset because they make the goal extremely clear," said project manager Fredrik Wenström at SVAFO. "With the requirements as a basis, the competent and pragmatic employees here at SVAFO have been able to solve the questions that arise at various stages in the best way." Vattenfall said the new interim storage facility is "an important piece of the puzzle" in the disposal of waste from the dismantling of the R2 and Ågesta facilities. At R2, research into nuclear technology was conducted

from 1960-2005, while Ågesta was Sweden's first commercial nuclear power plant, in operation from 1964 until 1974. Low- and intermediate-level waste from the decommissioning of the two facilities will be kept in the interim storage facility until the final repository for such waste in Forsmark is expanded. High-level used nuclear fuel from R2 and Ågesta will be stored in Svensk Kärnbränslehantering AB's Clab intermediate storage facility near Oskarshamn.

*Source: https://world-nuclear-news.org/Articles/Swedish-interim-radwaste-storage-facility-opens, 08 November 2022.*

Centre for Air Power Studies

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

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