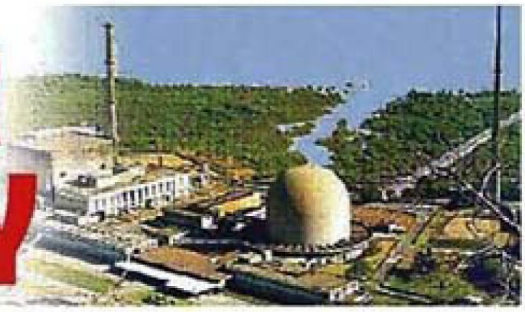
NUCLEAR SECURITY



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

Vol 17, No. 15, 01 JUNE 2023

CONTENTS

OPINION – Manpreet Sethi

25 Years of Nuclear India and Pakistan: Crisis Communications Must be Made a Priority

In May 1998, two countries, India and Pakistan, emerged as states with nuclear weapons. They also happened to be neighbours with disputed territorial claims. International reactions not only criticised and imposed sanctions on both, but also expressed anxiety about the two states getting themselves and the region into trouble, given their frequent crises, which now could lead up to nuclear escalation. Fears about the region becoming a nuclear flashpoint were strengthened when a conflict ensued at Kargil in 1999, where regular Pakistani soldiers clandestinely occupied Indian territory. India, however, conducted its military operations with a controlled use of force to avert escalation.

Simultaneously, the international community called out Pakistan for its nuclear blackmail. Military and diplomatic pressure eventually compelled Pakistan to withdraw. Another crisis, however, came along soon thereafter, when terrorists, supported, trained, and equipped by Pakistan, attacked the Indian Parliament in December 2001. India resorted to full scale military mobilisation and Pakistan responded similarly. After a tense, year-long stand-off, the situation de-escalated when then Pakistani President Gen. Musharraf committed to preventing his country from being used as staging ground for terrorist attacks on India. The promise unfortunately has not been kept. Terror attacks, supported and enabled by Pakistan, have been a regular disruptor of India-Pakistan relations.

Fears about the region becoming a nuclear flashpoint were strengthened when a conflict ensued at Kargil in 1999, where regular Pakistani soldiers clandestinely occupied Indian territory. India, however, conducted its military operations with a controlled use of force to avert escalation.

During such disruptions, India and Pakistan have normally reduced or cut-off their communications as a way of expressing displeasure. While this is not uncommon behaviour between adversarial dyads, the worry is that such a political state-of-affairs could exacerbate crisis situations. The resultant trust deficit can lead states into hedging strategies and offence-

defence capability build-up, thereby creating potential for more crises. Common sense demands communications during crisis—to arrest, contain, limit, and terminate it. This is especially critical between nuclear possessors, and they bear a special responsibility, for their own sake, to keep some accepted channels of communication open.

India and Pakistan have normally reduced or cut-off their communications as a way of expressing displeasure. While this is not uncommon behaviour between adversarial dyads, the worry is that such a political state-of-affairs could exacerbate crisis situations. The resultant trust deficit can lead states into hedging strategies and offence-defence capability build-up, thereby creating potential for more crises.

In fact, many things can go wrong in the absence of clear crisis communication protocols. First, it would be difficult to determine the right conduit or mechanism for communicating a threat or an assurance. Unless both sides have an established modus operandi or channels that have been regularly used and tested repeatedly for resilience, state wouldn't have a go-to, default option in a crisis. They will lose precious time trying to find the right way of communicating. This was evident in the recent incident when a Chinese balloon flew into American airspace. The lack of well-defined communication counterparts between the two countries eventually resulted in the US shooting the balloon down with a military aircraft. The possibility of escalation always looms in such a scenario.

Second, since trust is the first casualty in a crisis, the absence of a communications channel that both parties have some faith in can further degrade confidence. This is even more of a challenge in contemporary times, with an abundance of disinformation and deep fakes. Third, an absence of official communications inevitably leads to this space being occupied by a cacophonic media resorting to conjectures without a full sense of the situation. This can only deepen a crisis by playing up fears and paranoia. Also, social media platforms allow views, opinions, and emotions to be aired without any sense of accountability, thereby vitiating the atmosphere. Therefore, it is critical that crisis communications take place between authorised channels that are reliable and confidential, and even insulated from media influence. In crises, only established modes of communication, even if backchannels, can ensure timely transfer of messages that can be confidentially and reliably communicated to the adversary.

Fortunately, technology today can ensure technically reliable and efficient channels for quick delivery of messages. But the bigger problem of crisis communications is the absence of understanding their true value. This is exacerbated by the fact that states don't have a shared sense of risk that could be generated in the absence of communication. Rather, some countries believe that letting risks perpetuate better deters the adversary. Risk creation, therefore, takes precedence over risk reduction. China is a good example of this thinking. Beijing has resisted Washington's efforts to improve crisis communication channels. It believes that keeping these risks alive deter US provocations, which it might otherwise be tempted to take if it had the safety net of communications. So, China sees risks as useful for enhancing deterrence, and is not convinced about the desirability of crisis communications.

Fortunately, technology today can ensure technically reliable and efficient channels for quick delivery of messages. But the bigger problem of crisis communications is the absence of understanding their true value. This is exacerbated by the fact that states don't have a shared sense of risk that could be generated in the absence of communication.

In India and Pakistan's case, while several crisis communication channels are in place, they have not always been used optimally. For instance, the

DGMO hotline has existed for nearly 50 years now, but instances of their successful use have been few and far between. According to some accounts, during the Kargil conflict, it was used with mixed results. Tactical hotlines between local commanders have helped manage local stand-offs, monitor illegal border crossings, and even help each other in case of disasters, such as a major earthquake in Muzaffarabad in 2005. In 1989, a hotline between the Indian and Pakistani PMs was also instituted and used to exchange views and even establish dialogues. In fact, during the early part of the Kargil conflict, too, PM Vajpayee used the hotline to reach out to PM Nawaz Sharif. Thereafter, however, the use of this hotline is less known.

For instance, the DGMO hotline has existed for nearly 50 years now, but instances of their successful use have been few and far between. According to some accounts, during the Kargil conflict, it was used with mixed results. Tactical hotlines between local commanders have helped manage local stand-offs, monitor illegal border crossings, and even help each other in case of disasters, such as a major earthquake in Muzaffarabad in 2005.

Interestingly, in August 2005, special telephone lines were instituted between the deputy ministers for foreign affairs on both sides, particularly to prevent misunderstandings and reduce the risks from accidental missile launches. Yet, when such an incident did come to pass in March 2022 with the accidental launch of a cruise missile, the BrahMos, from India into Pakistan, according to publicly available information, the hotline wasn't activated by either side, whether to provide or to seek information. Two factors kept the situation from escalating: Pakistan's sober approach and India's wisdom in choosing to keep its nuclear and conventional missiles separately. However, accidents can still happen, and the value of crisis communications can't be emphasised enough.

Interestingly, in August 2005, special telephone lines were instituted between the deputy ministers for foreign affairs on both sides, particularly to prevent misunderstandings and reduce the risks from accidental missile launches. Yet, when such an incident did come to pass in March 2022 with the accidental launch of a cruise missile, the BrahMos, from India into Pakistan, according to publicly available information, the hotline wasn't activated by either side, whether to provide or to seek information.

Despite the fears of the western world, India and Pakistan have completed a quarter century without any nuclear incident. All crises have been handled with a high consciousness of risks and controlled use of force. Given, however, that the two countries have unresolved issues and grievances, it would be naïve to dismiss the possibility of crises in the future. It is, therefore, imperative to energise existing communication channels or build new ones to avert the possibility of a full-blown crisis and find ways to get out in case we slip into one. Not talking to each other because of a lack of clarity on how to communicate, or with whom, would be disastrous during a crisis. In fact, similar attempts at setting up credible crisis communication channels must be instituted with China, too. Even individuals keep emergency numbers handy. It would be dangerous, and foolish, for two nuclear nations to not do so as well.

Source: http://ipcs.org/comm_select.php?articleNo=5849, 25 May 2023.

OPINION – Sitakanta Mishra

Why Nuclear Can't be a Loner at the G20's People-Centric Energy Transition Agenda

Under India's presidency, G20 aims to address the pressing issues of climate change and energy security by building a sense of trusteeship to achieve clean energy transition. Four Energy Transition Working Group (ETWG) meetings, various side events, and a Ministerial Meeting are planned "to advance cooperation in clean energy transition and make it central to the agenda of sustainable economic development."

In this pursuit, while all options of "developing resilient renewable energy" sources like solar, wind, biofuel, battery, green hydrogen, etc. are pondered during the last two ETWG meetings, India has reportedly stressed "nuclear power as a non-renewable source of energy", therefore, is out of the G20 deliberation agenda currently; the reason being the member countries' favour for "a people-centric energy transition mechanism" says Alok Kumar, Secretary (Power) Government of India.

During Indonesia's Presidency of G20 (2021-22), nuclear power's role in the clean energy transition was debated in a virtual event. Prahoro Nurtjahyo, Co-Chair of the G20 ETWG, asserted that "nuclear will be a significant technology for clean energy systems, not only for developed countries but also emerging economies and developing countries.

Significant Technology for Clean Energy Systems: During Indonesia's Presidency of G20 (2021-22), nuclear power's role in the clean energy transition was debated in a virtual event. Prahoro Nurtjahyo, Co-Chair of the G20 ETWG, asserted that "nuclear will be a significant technology for clean energy systems, not only for developed countries but also emerging economies and developing countries." Similarly, Rafael Mariano Grossi, on the eve of the G20 Bali summit, said that the G20 "as a collective community…be very clear that we will need nuclear power….and nuclear deserves a footing equal to other low-carbon sources in the green transition…."

The current G20 agenda on energy transition pathways does not indicate any compromise with the present availability of the energy base of member countries; rather it suggests exploration of all feasible sources to achieve energy security; but the nuclear energy component does not find "equal footing for collaborative action" in the grouping's energy not people-centric? If renewable sources are the main target, atomic energy is renewable, though nuclear fuel (Uranium) is non-renewable.

Earlier in September 2020, the G20 Energy Ministerial Meeting Communique recognised the role of nuclear energy in providing clean energy in the promotion of the Circular Carbon Economy (CCE) for those who opt to use it, as well as in enhancing energy security; though challenges like decommissioning of reactors and disposal of waste are yet to be addressed amicably.

However, the current G20 agenda on energy transition pathways does not indicate any compromise with the present availability of the energy base of member countries; rather it suggests exploration of all feasible sources to achieve energy security; but the nuclear energy component does not find "equal footing for collaborative action" in the grouping's energy not people-centric? If renewable sources are the main target, atomic energy is renewable, though nuclear fuel (Uranium) is non-renewable.

How should we posit a clean and abundant source of energy like nuclear in the energy transition pathways? Is it prudent to overlook the carbon-free record of an energy source for its non-renewable nature? Can collaborative efforts by the G20 not help address the inherent technology gaps in the production of safe nuclear energy?

Ironically, all but five G20 countries have operating nuclear reactors; out of the five non-nuclear countries, Turkey and Saudi Arabia have already ventured into the civil nuclear program. According to the IEA 2018 report, nuclear power alone accounts for around 12% of total electricity generation in G20 countries. Of the 446 nuclear reactors operating worldwide, 89% are in G20 countries; of the 59 reactors under construction globally, 47 are in G20 countries. As per the latest trends, China, France and Russia are expected to consume most nuclear energy until 2026.

Nuclear energy remains the "second largest low-carbon source of low-emission power after hydropower" and a competitive source of reliable and sustainable energy. A number of G20 countries, including China, India, USA and Russia,

have identified nuclear power as a key part of their energy transitions, and of the ten countries that explicitly included nuclear in their climate action plan, five are G20 countries (Argentina, China, India, Japan and Turkey).

More Than Just a Power Source: Nuclear energy is more than just a power source; besides electricity generation and contribution to the circular carbon economy, nuclear energy offers unique opportunities to deliver valuable non-electric applications, ranging from district and industrial heat applications, desalination, and large-scale hydrogen production, etc. Nuclear energy production and consumption "has avoided about 70 giga tonnes of CO2 and reduced the enormous number of deaths caused by air pollution." It can also reduce CO2 emissions generated by the industry in non-electrical applications, such as hydrogen production, industrial steam, and water desalination.

In fact, according to IMF report (2021), "investment in nuclear power produced the biggest economic multiplier effect of any clean energy source, producing about 25 per cent more employment per unit of electricity than wind power, with workers in the nuclear industry earning one-third more than those in the renewable energy industry."

Non-inclusion of nuclear energy component in the energy transition agenda of G20 for it not renewable and people-centric seems a drastic departure from the collective community effort to upgrade nuclear technology that provides a quarter of the world's low-carbon electricity today. One wonders which other clean, renewable, people-centric energy option can cater to the base-load energy requirement for heavy industries today! In reality, energy 'efficiency' should play an important role in all future energy systems, not just 'renewability'.

Non-inclusion of nuclear energy component in the energy transition agenda of G20 for it not renewable and people-centric seems a drastic departure from the collective community effort to upgrade nuclear technology that provides a quarter of the world's low-carbon electricity today. One wonders which other clean, renewable, people-centric energy option can cater to the base-load energy requirement for heavy industries today! In reality, energy 'efficiency' should play an important role in all future energy systems, not just 'renewability'.

The side-effects of massive renewable energy projects like solar is yet to come to light. Especially management of the solar PV waste, its land footprint vis-à-vis other sources, health hazards, etc. must factor in. The Vivekanand International Foundation (VIF) Task Force on India's Energy Transition asserts that the "Renewables have a much larger land footprint than nuclear power plants."

Besides, prominent members of the G20 such as China, India, Russia, South Korea and the USA are striving to increasing their nuclear energy consumption significantly in the foreseeable future. "Nuclear make a huge contribution in providing stability to a carbon-neutral power system in China in 2060." It has increased its nuclear energy consumption during 2011 to 2021 and is expected to ascend until 2026. "India's consumption may increase from 0.4 exajoules in 2021 to 0.57 exajoules in 2026."

Need of the Hour: Therefore, the need of the hour is to delve into and ponder over global best practices to address technological gaps, patronaging innovative risk-free reactor designs, reducing gestation period, extending reactor lifespan, increasing cost-competitiveness, and solving waste disposal problems, the G20 forum could have carried forward global efforts to harness a clean and abundant source of energy.

Besides, prominent members of the G20 such as China, India, Russia, South Korea and the USA are striving to increasing their nuclear energy consumption significantly in the foreseeable

future. "Nuclear make a huge contribution in providing stability to a carbon-neutral power system in China in 2060." It has increased its nuclear energy consumption during 2011 to 2021 and is expected to ascend until 2026. "India's consumption may increase from 0.4 exajoules in 2021 to 0.57 exajoules in 2026."

Similar push for increasing nuclear energy's share in the energy basket is happening in Global South countries. Bangladesh is completing the country's first nuclear power plant with the help of Russian State Atomic Energy Corporation Rosatom. Egypt, Jordan, Turkey and Indonesia are some other Global South countries turning towards nuclear to fulfil the energy demand.

When a majority of members, and significant number of countries from Global South, have been sure of and embarked on ambitious nuclear energy projects as part of their green energy transition mechanism, the exclusion of nuclear energy in formal deliberations of G20 may strengthen the prevailing public scepticism involving nuclear technology in general, and weaken any collective action for maturing nuclear technology in particular.

Source: https://www.cnbctv18.com/views/energy-security—an-academics-take-on-why-nuclear-cant-be-a-loner-at-the-g20s-people-centric-energy-transition-agenda-16718371.htm, 21 May 2023.

OPINION – George Lackey

How a Crew of Peace Activists Challenged the Nuclear Arms Race – and Won a Major Victory

In today's polarized context, progressive movements need their best strategic thinking. One source for inspiration should be the Golden Rule, a historic sailing ship that's currently visiting ports along the Eastern U.S. Organized by Veterans for Peace, this national tour puts the 1958 Golden Rule voyage back in the news. Nearly 65 years ago, the Golden Rule defiantly sailed toward the Pacific Ocean site where U.S. nuclear weapons were being tested, sparking a movement that forced the US government to sign the PTBT....

In today's polarized context, progressive movements need their best strategic thinking. One source for inspiration should be the Golden Rule, a historic sailing ship that's currently visiting ports along the Eastern U.S. Organized by Veterans for Peace, this national tour puts the 1958 Golden Rule voyage back in the news.

The planners of the 1958 voyage were tuned into what was working for the emerging civil rights movement in the Deep South, and that gave them a powerful strategic perspective on the issue they were aiming to impact...the anti-nuclear strategists who came up with the Golden Rule voyage understood that the nuclear arms race was systemic. Leaders like Lawrence C. Scott knew their only chance of building a movement of sufficient scale to defeat nukes was to start by breaking off a smaller piece....

Looking for a particularly vulnerable aspect of nuclear weapons, they saw their chance: nuclear testing in the atmosphere, which resulted in grass-fed cows giving radiated milk that produced leukemia in babies. Atmospheric testing was the weak link in the chain that maintained the nuclear arms race, so it was the place to start. Like civil rights strategists, anti-nuke strategists knew that dramatic tactics would be necessary to energize growing activism. In Montgomery, the arrest of volunteer Rosa Parks, a widely-known and respected woman in the Black community, sparked a large response. For opposing nuclear testing, the dramatic equivalent might be to sail a crew of concerned citizens into the testing area, where deadly radiation waited. The crew's display of courage was key....

Mass Media Slowness as an Advantage:...Movements through direct action by contrasting the Montgomery boycott and the anti-nukes struggle. In Montgomery, organizing had already been done before the direct action because a critical mass of Black people were church-goers or members of other Black organizations. When Rosa Parks was arrested, the

word spread overnight, along with the campaign leaders' urging to boycott the buses. For anti-nukers, it was a completely different story. The peace media were small, so mass media were needed, even though they are often slower to respond to activist campaigns. George Willoughby later explained…advantage of the long sail to the expected point of confrontation: Moving a sailboat a considerable distance in an ocean takes time, which allows the mass media to catch up. In the process, progressives can find each other, then enroll others to build a larger movement against the arms race.

Much like the Montgomery campaign's decision to have the highly-credible Rosa Parks be the first to face arrest, the choice for the Golden Rule's captain was also strategic. Albert Bigelow not only had a U.S. Navy background, but he commanded a warship during World War II…Another advantage of the strategy deployed by the Golden Rule and the Montgomery bus boycott was that both chose tactics that could be used by others in similar or different ways. When the Golden Rule was stopped by the U.S. government near Hawaii, Earle and Barbara Reynolds used their family's sailing ship the Phoenix to continue the voyage toward the testing area.

Much like the Montgomery campaign's decision to have the highly-credible Rosa Parks be the first to face arrest, the choice for the Golden Rule's captain was also strategic. Albert Bigelow not only had a U.S. Navy background, but he commanded a warship during World War II…Another advantage of the strategy deployed by the Golden Rule and the Montgomery bus boycott was that both chose tactics that could be used by others in similar or different ways.

A decade later, activists with A Quaker Action Group, or AQAG, in turn used the Phoenix to bring medical aid to Vietnamese civilians suffering from the U.S. Naval blockade of the Vietnamese coast. Taking its cue from the Golden Rule voyage a decade earlier, the Phoenix's voyages to Vietnam had the aim of launching a mass movement at a moment when none existed. Where the Golden Rule targeted Americans' fears of radiation, the Phoenix targeted Americans' sympathy and compassion for innocent civilians suffering widespread violence.

The drama of the Phoenix voyages, like the Golden Rule, included suspense: What will happen when confronting warships? And the courage of the Phoenix crew, like that of the Golden Rule, made an implicit invitation for movement activists to step up their own level of activity. Finally, the inherent slow-moving nature of the tactic gave time for the mass media to report, while also incentivizing activist newcomers to find each other — all of which grew the movement. In these and many other examples of direct action, a straight line can't be drawn between the action and a win like gaining the atmospheric nuclear test ban treaty. The direct action impact is often to build a movement sufficiently large and powerful enough to force the needed changes.

Putting the Opponent in a Dilemma: The strategy deployed by the voyage of the Golden Rule — and the civil rights movement before it and the Phoenix after it — builds the kind of power more activists could be using today. It comes from a tactic…"dilemma demonstration," which basically puts the opponent in a lose-lose situation. The Montgomery city government, for example, was in a dilemma. If it allowed Rosa Parks to continue to sit wherever she pleased, it would have lost its segregated transit policy. At the same time, however, it also lost by arresting her, because it stimulated a widespread resistance movement.

Similarly, if the U.S. government allowed the Golden Rule crew to reach the nuclear testing zone and the crew members developed cancer, the government would have lost. It would publicize the growing medical evidence that the U.S. government was actively spreading cancer among American babies. In 1958, the U.S. chose the other horn of its dilemma: arresting the gallant crew of the Golden Rule, which of course also benefitted the nuclear test ban movement. The impetus helped the movement grow large and pressure the U.S. government into signing the 1963 treaty banning

nuclear weapons tests in the atmosphere…. We're lucky that Veterans for Peace rebuilt — and is sailing — the Golden Rule once again. It gives all of us activists inspiration and the opportunity to think more about how to use direct action for building our movements.

Source: https://www.analystnews.org/posts/how-peace-anti-nuclear-activists-challenged-the-nuclear-arms-race-and-won, 24 May 2023.

In 1958, the U.S. chose the other horn of its dilemma: arresting the gallant crew of the Golden Rule, which of course also benefitted the nuclear test ban movement. The impetus helped the movement grow large and pressure the U.S. government into signing the 1963 treaty banning nuclear weapons tests in the atmosphere…

OPINION – Mirium Fauzia

Despite Germany Shutting Down its Plants, We Could Be Entering a Nuclear Power Renaissance

Throughout the 20th century, the societal attitude toward nuclear energy has been a complex and evolving narrative, seesawing between periods of bright-eyed optimism and well-founded skepticism. There was the Atoms for Peace initiative of the 1950s, followed by the strong anti-nuclear movement of the 70s and 80s shaped by the watershed moments at Three Mile Island and Chernobyl. With the looming threat of climate change, fears softened, and nuclear capacity expanded in the early 2000s—often referred to as the nuclear renaissance—before souring again in 2011 after the disaster at Fukushima.

This past April 2023, Germany announced it was going cold turkey, shutting down its remaining nuclear plants that had been supplying electricity to more than one-quarter of German households. The decision didn't come out of the blue—Germany planned for the complete closure of its nuclear reactors back in 2011. It's a move decried by nuclear energy proponents as jeopardizing the country's efforts toward its carbon-neutral climate targets. Germany isn't an isolated case.

Now, as the world moves toward a renewable energy future, the role of nuclear power hangs in the balance. This past April 2023, Germany announced it was going cold turkey, shutting down its remaining nuclear plants that had been supplying electricity to more than one-quarter of German households. The decision didn't come out of the blue—Germany planned for the complete closure of its nuclear reactors back in 2011. It's a move decried by nuclear energy proponents as jeopardizing the country's efforts toward its carbon-neutral climate targets. Germany isn't an isolated case. Since 2012, 12 nuclear reactors in the U.S. have permanently closed, with the most recent being New York's Indian Point nuclear plant in 2021. According to a 2019 report by the IEA, 25 percent of "existing nuclear capacity in advanced economies [are] expected to be shut down by 2025."

While it's tempting to see this as nuclear energy's swan song, some may argue it's more like a phoenix rising from radioactive ashes. The industry is experiencing developments in next-generation reactors a fraction the size of massive power plants. There's also considerable cash flowing in by the millions from federal and private investments into nuclear technology companies like Bill Gates' TerraPower. And then there's the heightened demand for energy security through nuclear energy brought on by Russia's ongoing invasion of Ukraine. So what *does* the future hold for nuclear energy in our world of mixed emotions? A lot of innovation, a fair bit of promise, but still many challenges and concerns to overcome.

It's All About Downsizing: While new nuclear power plants in the U.S. are becoming scarce, there are two additional reactors being added to Georgia's Plant Vogtle, which are expected to be operational by early 2024. However, the focus of the newest, fourth-generation nuclear efforts is on

downsizing to achieve reactors more manageable and potentially more energy-needs bespoke…. "Around 20 to 30 years ago, we got interested in expanding the portfolio of [nuclear energy] options,"…"You can't take a gigawatt-scale pressurized water reactor and plop it down in the middle of rural Alaska. So the idea was that we could improve the economy and the options by expanding into small modular reactors."

Unlike their nuclear progenitors, SMRs and microreactors are prefabricated units that can be delivered and assembled virtually anywhere, installed into an existing power grid or remotely off-grid, an approach offering potential cost and time savings compared to the construction of larger reactors.

Despite the name, SMRs and their compact kin microreactors aren't exactly pocket-sized…. SMRs weigh on the order of 20 tons and microreactors are about 100 to 1,000 times smaller than conventional nuclear reactors. The energy generated is significantly less but still impressive—anywhere from 50 to 300 megawatts, more than enough to power a small town or city…. Unlike their nuclear progenitors, SMRs and microreactors are prefabricated units that can be delivered and assembled virtually anywhere, installed into an existing power grid or remotely off-grid, an approach offering potential cost and time savings compared to the construction of larger reactors. The technology used is still the same with water or another substance like gas being used as a coolant or to moderate the nuclear reaction. The main difference…is that many SMRs and microreactors make use of passive safety features rather than active ones, which reduces the risk of accidents and minimizes the need for operator intervention. For example, instead of mechanically pumping coolant, some downsized nuclear reactors like NuScale's SMR, whose design was approved by federal regulators in 2022, use natural convection for cooling.

But It's Not All About Electricity: No doubt electricity is king in our modern world, but the future of nuclear energy goes beyond powering homes or having enough charge on your Steam Deck. "People are now looking at what we call cogeneration"…this involves taking the surplus heat produced as a byproduct of nuclear fission and transferring it into other processes. This could be a district heating system where it's used to provide space heating and hot water for residential, commercial, and industrial buildings in nearby communities. It could be industrial where high-temperature heat is needed for chemical manufacturing, food processing, or steam generation.

By combining electricity generation with heat utilization, cogeneration maximizes the energy efficiency and overall output of a nuclear power plant…. It can significantly increase the overall efficiency of a nuclear plant by utilizing the heat that would otherwise be wasted, thereby reducing the environmental impact and improving the economics of the nuclear energy.

Nuclear energy accounted for about 1.1 percent of primary energy (not including biomass energy used by households) in India, 1.6 percent of generation capacity and 2.8 percent of power generation in 2021. The installed capacity for nuclear power generation was 6,780 MW (megawatt) from 22 reactors.

Source: https://www.popularmechanics.com/science/energy/a43929475/future-of-nuclear-energy/, 22 May 2023.

OPINION – Lydia Powell, Akhilesh Sativinod Kumar Tomar

India's Targets for Nuclear Energy: Moving Closer?

Nuclear energy accounted for about 1.1 percent of primary energy (not including biomass energy used by households) in India, 1.6 percent of generation capacity and 2.8 percent of power generation in 2021. The installed capacity for nuclear power generation was 6,780 MW (megawatt) from 22 reactors. This includes the 700 MW PHWR, unit 3 of the KAPP that was synchronised with the grid in January 2021. 15 more such units are expected to follow in fleet

mode. Nuclear power plants of capacity 8,700 MW are under construction.

Capacity Addition Targets: In 2004, the target set for nuclear power capacity was 20,000 MW by 2020. In 2007, the Government stated that this target could be doubled with the opening up of international cooperation through the 123 nuclear agreement that was to be signed with the U.S in 2008. In 2009, the NPCIL said that it aimed for a capacity of 60,000 MW by 2032 including 40,000 MW of PWRs and 7000 MW of PHWRs all powered by imported uranium. Projections in the draft energy policy of 2017 are more modest with 12,000 MW nuclear power capacity in 2022 and 34,000 MW in 2040 even under the 'ambitious' scenario.

In 2021, the government stated in the Parliament that nuclear power generation capacity would increase to 22,480 MW by 2031. This figure was reiterated in the Parliament in 2022. India's targets for nuclear power generation capacity addition have been described as aspirational by experts from the DAE. One of the key reasons why India's targets for nuclear power generation capacity remain aspirational is the difficulty in mobilising investment.

Economics: According to the CEA (central electricity authority), the capital cost of a PHW nuclear power plant in India is about INR 117 million (INR11.7 crore)/MW in 202122 and INR 142 million (INR14.2 crore)/MW in 2026-27. Other estimates are higher at INR 160 -25 million/MW (INR16 -25 crore/MW). The average capital cost of nuclear power is in the same range as that of large hydro-power projects or LNG liquefaction plants but it is far more difficult to raise capital for nuclear power plants as they are exposed to unique risks (low probability but high-risk events such as natural disasters, terrorist attacks, nuclear proliferation problems).

According to the CEA (central electricity authority), the capital cost of a PHW nuclear power plant in India is about INR 117 million (INR11.7 crore)/MW in 202122 and INR 142 million (INR14.2 crore)/MW in 2026-27. Other estimates are higher at INR 160 -25 million/MW (INR16 -25 crore/MW). The average capital cost of nuclear power is in the same range as that of large hydro-power projects or LNG liquefaction plants but it is far more difficult to raise capital for nuclear power plants.

In addition, there are issues like long lead times, risk of construction problems, delays and cost overruns and the possibility of future changes in policy or technology. Globally escalating costs and delays of new nuclear projects have devastated the industry, forcing two of its powerhouses, Westinghouse and Areva, into bankruptcy. This has increased preference for low carbon sources like solar power. But the capacity adjusted (80 percent capacity factor) capital cost of nuclear power is INR 250 million/MW (INR 25 crore/MW) while the capacity adjusted (25 percent capacity factor) capital cost of solar power is INR 300 million/MW (INR30 crore/MW) according to NPCIL.

The value adjusted levelised cost of electricity (VALCOE) of nuclear power is lower than that for solar or wind especially when the life of nuclear plants is extended. VALCOE incorporates information on both costs and the value including estimates of energy, capacity and flexibility to provide a more complete metric of competitiveness for power generation technologies.

The IEA makes a similar argument stating that nuclear power will remain the dispatchable low-carbon technology with the lowest expected costs in 2025. The value adjusted levelised cost of electricity (VALCOE) of nuclear power is lower than that for solar or wind especially when the life of nuclear plants is extended. VALCOE incorporates information on both costs and the value including estimates of energy, capacity and flexibility to provide a more complete metric of competitiveness for power generation technologies. VALCOE of electricity from intermittent sources like wind and solar increases as the share of electricity from these

sources increases while the VALCOE of nuclear power decreases as its share of electricity supplied to the grid increases. The life of a nuclear plant is greater than 60 years (close to 100 years) and that of solar plants is about 20 years which adds to the economic value of nuclear power plants.

Moreover, the system integration cost of nuclear plants is US$2/MWh compared to about US$43/MWh for renewable generators. The cost of electricity generated by nuclear power plants compares well with electricity from other sources. In fact, the tariff for firm (dispatchable) electricity from TAPS 1&2, the oldest nuclear power generator in India, is about INR2/kWh.

Moreover, the system integration cost of nuclear plants is US$2/MWh compared to about US$43/MWh for renewable generators. The cost of electricity generated by nuclear power plants compares well with electricity from other sources. In fact, the tariff for firm (dispatchable) electricity from TAPS 1&2, the oldest nuclear power generator in India, is about INR2/kWh. This is lower than the lowest tariff of solar power which is intermittent. The cost of power from newer plants like Kudankulam is in the range of INR4-6/kWh comparable to power from some thermal power plants and also comparable to a hybrid solar-pumped hydropower combination.

In India, specific generation, a parameter that signals economic efficiency of power generation (gigawatt hours of power generated for a megawatt of capacity) was highest for nuclear power at 6.35 compared to 4.74 for coal-based power, the second highest in 2020-21. The specific generation of nuclear power has been consistently higher than the average specific generation value over the last two decades.

According to NPCIL, the land footprint of nuclear power is at least 20 times smaller than that of solar energy. The average lifecycle GHG emissions from solar is 50 grams/kWh compared to 14 g/kWh for nuclear power. Globally, the use of nuclear power has reduced CO2 emissions by about 60 gigatonnes, or nearly two years' worth of emissions over the past 50 years. Without nuclear power, emissions from power generation would have been almost 20 percent higher.

Carbon Emission Reduction: According to NPCIL, the land footprint of nuclear power is at least 20 times smaller than that of solar energy. The average lifecycle GHG emissions from solar is 50 grams/kWh compared to 14 g/kWh for nuclear power. Globally, the use of nuclear power has reduced CO2 emissions by about 60 gigatonnes, or nearly two years' worth of emissions over the past 50 years. Without nuclear power, emissions from power generation would have been almost 20 percent higher. Institutions such as the IEA that favour nuclear power for decarbonisation argue that the world risks a steep decline in nuclear power in developed countries that could lead to billions of tonnes of extra carbon emissions. According to the IEA, without new nuclear power, the energy transition will become more difficult and more expensive. But sceptics of nuclear energy point to the risks of nuclear energy citing well-known accidents from Three Mile Island in the US, Chernobyl in Russia and Fukushima in Japan. Nuclear reactors generate radioactive waste that remains dangerous for hundreds of thousands of years and the first deep geological disposal facility for nuclear waste is still on the drawing board.

Small Modular Rectors: In 2019, for the first time in history, non-hydro renewables like solar, wind and biomass generated more electricity than nuclear power plants globally. Global nuclear power generation peaked in 2006 and there were fewer reactors operating around the world at the end of 2021 than 30 years ago. Even in China that is building several nuclear power generators, renewables generated more than twice the electricity than nuclear power in 2021. The general perception that large nuclear reactors are too expensive and too dangerous have resulted in support for SMRs around the world and also in India.

Since the 1950s, when nuclear power generation was established, the size of the reactors has increased from 60 MW to more than 1,600 MW, with corresponding economies of scale in operation. SMRs generally have a capacity of 300 MW or less and are designed with modular technology using module factory fabrication, pursuing economies of series production and short construction times. There have been many hundreds of smaller power reactors built for naval use (up to 190 MW thermal) and as neutron sources, yielding enormous expertise in the engineering of small power units.

SMR has far fewer moving parts than traditional reactors, lowering the likelihood of failures that could cause an accident. Building smaller reactors is also expected to lead to mass-manufacturing which reduces cost and lead times. India's nuclear industry which consists mostly of small reactors did not necessarily result in lower costs. Out of India's 22 nuclear power reactors, 18 have a capacity of less than 300 MWe which means that most are "small" reactors.

SMRs are much less likely to overheat, in part because their small cores produce far less heat than the cores in large reactors. Innovative designs in SMR technology can also reduce other engineering risks, like coolant pumps failing. SMR has far fewer moving parts than traditional reactors, lowering the likelihood of failures that could cause an accident. Building smaller reactors is also expected to lead to mass-manufacturing which reduces cost and lead times. India's nuclear industry which consists mostly of small reactors did not necessarily result in lower costs. Out of India's 22 nuclear power reactors, 18 have a capacity of less than 300 MWe which means that most are "small" reactors. The small size of India's nuclear reactors has meant that India's total nuclear power capacity is low compared to the number of nuclear power reactors.

The ten largest nuclear islands of China consist of 43 nuclear reactors with total capacity of 45,600 MWe. All the reactors in these nuclear islands have capacity of 1000 MWe barring the oldest reactor that has a capacity of 600 MWe. With double the number of reactors compared to India, China has more than 6 times the nuclear capacity of India. South Korea has 24 nuclear power reactors, just two more than that of India, but the total nuclear power capacity of South Korea is 23,150 GWe, more than three times that of India. India's small reactors have not necessarily meant lower costs, nor have they meant fewer experts employed per reactor. It has in fact reduced the contribution of the nuclear sector to overall power generation and consequently not contributed substantially to reduce carbon-di-oxide emissions. It also increased the tariff for nuclear power as costs cannot be spread over larger capacity. The assumption that additional costs incurred by SMRs can be offset through economies of mass production remains to be tested because as of 2022, there are no mass orders for SMRs. Overall, SMRs may not be the means to achieve India's ambitious targets for nuclear power.

The assumption that additional costs incurred by SMRs can be offset through economies of mass production remains to be tested because as of 2022, there are no mass orders for SMRs. Overall, SMRs may not be the means to achieve India's ambitious targets for nuclear power.

According to media reports, the Niti Aayog has recommended changes to the Atomic Energy Act 1962 to allow foreign investment in its nuclear power industry and mobilise greater participation by domestic private firms. If private investment materialises, India may move closer to its targets for nuclear power generating capacity. However, it remains to be seen how the fundamental incompatibility between India's civil liability law and international conventions are resolved.

Source: https://www.orfonline.org/expert-speak/indias-targets-for-nuclear-energy-moving-closer/ , 18 May 2023.

NUCLEAR STRATEGY

CHINA

China Refutes G7's Accusations on its Nuclear Policy

G7's accusations against China's nuclear policy are complete false narratives, Chinese Foreign Ministry spokesperson Mao said on May 22 during a regular press briefing.... China is committed to a self-defensive nuclear strategy in response to G7 leaders' accusation against China for "accelerating build-up of its nuclear arsenal without transparency nor meaningful dialogue." China sticks to the policy of no-first-use of nuclear weapons and keeps those capabilities at the minimum level required by national security...echoing Chinese Vice Foreign Minister Sun's remarks on May 21 as he summoned Japanese Ambassador to China Tarumi to lodge representations over the G7 Hiroshima Summit. "China is the only one among the five nuclear weapon states to have made those pledges"....

In response to accusation on China's transparency, the spokesperson vowed that any country that does not use or threaten to use nuclear weapons against China will not be threatened by China's nuclear weapons. The G7 is in no position to dictate to other countries on nuclear arms control...adding that the U.S. possesses the world's largest and most advanced nuclear arsenal, yet it adheres to the policy of first use of nuclear weapons.

In response to accusation on China's transparency, the spokesperson vowed that any country that does not use or threaten to use nuclear weapons against China will not be threatened by China's nuclear weapons. The G7 is in no position to dictate to other countries on nuclear arms control...adding that the U.S. possesses the world's largest and most advanced nuclear arsenal, yet it adheres to the policy of first use of nuclear weapons and proliferates weapons-grade HEU to non-nuclear-weapon states. Three of the G7 members are nuclear weapon states, and the remaining four participate in nuclear sharing or sit under a nuclear umbrella....

Source: https://news.cgtn.com/news/2023-05-22/China-refutes-G7-s-accusations-on-its-nuclear-policy-1k144bHypdS/index.html, 22 May 2023.

IRAN

Iran Successfully Launches Newest Ballistic Missile

Iran successfully tested a 2,000 km-range ballistic missile on May 25...two days after the chief of Israel's armed forces raised the prospect of "action" against Tehran over its nuclear program. Iran, which has one of the biggest missile programs in the Middle East, says its weapons are capable of reaching Israel and US bases in the region. Despite opposition from the U.S. and European countries, Tehran has said it would further develop its "defensive" missile program.

Iran successfully tested a 2,000 km-range ballistic missile on May 25...two days after the chief of Israel's armed forces raised the prospect of "action" against Tehran over its nuclear program. Iran, which has one of the biggest missile programs in the Middle East, says its weapons are capable of reaching Israel and US bases in the region.

"Our message to Iran's enemies is that we will defend the country and its achievements. Our message to our friends is that we want to help regional stability," said Iranian defense minister Ashtiani. State TV broadcast what it said was footage of an upgraded version of Iran's Khoramshahr 4 ballistic missile with a range of 2,000km that can carry a 1,500kg warhead.... Israel, which the Islamic Republic does not recognize, sees Iran as an existential threat. Iran says its ballistic missiles are an important deterrent and retaliatory force against the U.S., Israel and other potential regional adversaries.

On May 23, the top Israeli general raised the prospect of "action" against Iran as efforts by six world powers to revive Tehran's 2015 nuclear deal have stalled since September 2022 amid growing Western fears about Tehran's accelerating nuclear

advances. The nuclear agreement, which Washington ditched in 2018, imposed restrictions on Iran's nuclear activities that extended the time Tehran would need to produce enough fissile material for a nuclear bomb, if it chose to. Iran denies seeking nuclear weapons.

Source: https://www.arab news.com/node/ 2309961 /middle-east, 25 May 2023.

RUSSIA–BELARUS

Russia Signs Deal to Deploy TNWs in Belarus, Says they Stay Under its Control

Russia and Belarus signed a deal on Thursday to formalise the deployment of Russian tactical nuclear missiles on Belarusian territory, a step Moscow said was driven by rising tensions with the West. "In the context of an extremely sharp escalation of threats on the western borders of Russia and Belarus, a decision was made to take countermeasures in the military-nuclear sphere"....

NATO said at the time it did not see any need to adjust its own nuclear posture, though it said Putin's nuclear rhetoric was "dangerous and irresponsible". Ukraine said Russia's ally Belarus had been "taken hostage" by Moscow.

The deployment of the missiles was first announced by President Putin in March 2023. Since invading Ukraine last year, Putin has said repeatedly that Russia would be ready to use nuclear weapons if needed to defend its "territorial integrity". NATO said at the time it did not see any need to adjust its own nuclear posture, though it said Putin's nuclear rhetoric was "dangerous and irresponsible". Ukraine said Russia's ally Belarus had been "taken hostage" by Moscow. Moscow will retain control over the weapons and any decisions on their use, Defence Minister Shoigu said....

Iskander-M missiles, which can carry conventional or nuclear warheads, had been handed to the Belarusian armed forces, and some Su-25 aircraft had been converted for the possible use of nuclear weapons. "Belarusian servicemen have received the necessary training in Russian training centres."..... He added that the agreements signed with his Belarusian counterpart covered the procedure for establishing a "special storage facility for nuclear weapons on Belarusian territory." Tactical nuclear weapons refer to lower-yield weapons designed for battlefield use, as opposed to strategic ones capable of wiping out entire cities. Russia has not disclosed how many tactical nuclear weapons it has.

Source: https://www.reuters.com/business/ aerospace-defense/russia-belarus-sign-document-tactical-nuclear-weapon-deployment-belarus-2023-05-25/, 25 May 2023.

USA

Report to Congress on Great Power Competition

The emergence over the past decade of intensified U.S. competition with China and the Russian Federation—often referred to as great power competition (GPC) or strategic competition—has profoundly changed the conversation about U.S. defense issues from what it was during the post–Cold War era: Counterterrorist operations and U.S. military operations in the Middle East—which had been more at the center of discussions of U.S. defense issues following the terrorist attacks of September 11, 2001—are now a less-prominent element in the conversation, and the conversation now focuses more on the following elements, all of which relate largely to China and/or Russia:

· grand strategy and geopolitics as a starting point for discussing U.S. defense issues;

· the force-planning standard, meaning the number and types of simultaneous or overlapping conflicts or other contingencies that the U.S. military should be sized to be able to conduct—a planning factor that can strongly impact the size of the U.S. defense budget;

· organizational changes within the Department of Defense (DOD);

· nuclear weapons, nuclear deterrence, and nuclear arms control;

· global U.S. military posture; U.S. and allied military capabilities in the Indo-Pacific region;

· U.S. and NATO military capabilities in Europe; new U.S. military service operational concepts; capabilities for conducting so-called high-end

conventional warfare;

· maintaining U.S. superiority in conventional weapon technologies;

· innovation and speed of U.S. weapon system development and deployment;

· mobilization capabilities for an extended-length large-scale conflict;

· supply chain security, meaning awareness and minimization of reliance in U.S. military systems on foreign components, subcomponents, materials, and software; and

· capabilities for countering so-called hybrid warfare and gray-zone tactics.

The issue for Congress is how U.S. defense planning and budgeting should respond to GPC and whether to approve, reject, or modify the Biden Administration's defense strategy and proposed funding levels, plans, and programs for addressing GPC.

The issue for Congress is how U.S. defense planning and budgeting should respond to GPC and whether to approve, reject, or modify the Biden Administration's defense strategy and proposed funding levels, plans, and programs for addressing GPC. Congress's decisions on these issues could have significant implications for U.S. defense capabilities and funding requirements and the U.S. defense industrial base.

Source: https://news.usni.org/2023/05/24/report-to-congress-on-great-power-competition-6, 24 May 2023.

BALLISTIC MISSILE DEFENCE

SOUTH KOREA

South Korea Company Fuses AI with Imagery to Detect Ballistic Missiles

A South Korean company specializing in satellite imagery analysis is developing new techniques to identify missiles, launchers and supporting infrastructure in North Korea with potential applications far beyond the shared peninsula. SI Analytics...on May 22 briefed reporters on the North Korea Dynamic Ballistic Missile Operation Area Search Project at the GEOINT Symposium in St. Louis. The company previously competed in U.S. Defense Innovation Unit challenges, including building damage assessments and detection of so-called dark vessels that don't broadcast their location or appear in public monitoring systems.

The latest project fuses earth-observation data from multiple commercial satellite operators with in-house artificial intelligence-augmented image analysis to detect and classify anomalies — North Korean ballistic missile operations, for example. The findings, once verified by experts, can then be shared, facilitating a government response. "We will contribute our private sector capability and effort for a safer world"…. "As can be seen in the media, the news, there is increasing global stress from North Korea."

The latest project fuses earth-observation data from multiple commercial satellite operators with in-house artificial intelligence-augmented image analysis to detect and classify anomalies — North Korean ballistic missile operations, for example.

North Korean missile tests rattle neighbors and far-flung nations alike. They also draw widespread condemnation. A joint statement issued this week by South Korea and the European Union described North Korean developments as "reckless" and as a "serious threat" to "international and regional peace and security." A meaningful dialogue is needed, it continued, as is a suspension of "all actions that raise military tensions." SI Analytics was established in 2018. It is based in Daejeon, with offices in Seoul and Gwangju.

Source: https://www.c4isrnet.com/industry/2023/05/23/s-korea-company-fuses-ai-with-imagery-to-detect-ballistic-missiles/, 24 May 2023.

USA

America's Missile Defense System is in Tatters, Government Report Finds

America's missile defense systems are in dire need of operational upgrades as "threats from foreign adversaries" grow more dire, a

government watchdog found. The U.S. Missile Defense Agency has repeatedly failed to upgrade its radar and missile interceptor systems, according to a report by the Government Accountability Office.

The agency's failures have left America's missile defense system with less fielded capability than planned, leaving the country vulnerable to "missile threats from foreign adversaries," such as China, Iran, and North Korea. Supply-line issues and a developmental backlog have prevented the Pentagon's top missile defense systems from receiving critical updates, the report found.

The agency's failures have left America's missile defense system with less fielded capability than planned, leaving the country vulnerable to "missile threats from foreign adversaries," such as China, Iran, and North Korea. Supply-line issues and a developmental backlog have prevented the Pentagon's top missile defense systems from receiving critical updates, the report found. The findings are a warning bell for the Biden administration as it faces down a range of threats from increasingly hostile nations like North Korea and Iran. The country's missile defense systems are the primary vehicle for destroying an incoming payload before it hits the country. The Missile Defense Agency's repeated failure to upgrade and test its equipment signals the U.S may not be prepared to handle rapidly evolving threats from nations like China, which currently has more intercontinental ballistic missiles than the U.S.

The Department of Defense has poured $194 billion into the Missile Defense Agency since 2002, including a $10.4 billion investment in 2022. The agency's main goal is to develop systems capable of tracking and destroying missiles mid-flight. But according to the GAO report, these funds have not been sufficient to keep the Missile Defense Agency fully operational and prepared to fend off an attack from the country's enemies.

The Department of Defense has poured $194 billion into the Missile Defense Agency since 2002, including a $10.4 billion investment in 2022. The agency's main goal is to develop systems capable of tracking and destroying missiles mid-flight. But according to the GAO report, these funds have not been sufficient to keep the Missile Defense Agency fully operational and prepared to fend off an attack from the country's enemies. Over the course of the GAO's multiyear investigation, "missile threats from foreign adversaries have evolved, and MDA has faced persistent challenges as it attempts to keep pace."

In 2022 alone, the agency "didn't deliver all of its planned interceptors and radar upgrades," according to the report. "MDA also didn't complete its planned flight, ground, or cyber tests for its systems." The agency has been falling short for several years, according to the GAO, which reported that the Missile Defense Agency still has not implemented "23 previously issued recommendations" related to its "testing, transparency, and cost reporting." The agency only "partially met its sensor delivery goals," and has "delayed operational acceptance of two radars" until later this year at the earliest....These types of delays have been occurring for several years, indicating that proposed upgrades to the system were put on the back burner.

While the agency was slated to conduct nine flight tests in 2022, it completed only six. "Of the six conducted tests, MDA successfully achieved objectives in one test where MDA was the primary participant and four where MDA participated with external partners, such as the Air Force or foreign allies," according to the report. Several other tests were delayed at the request of foreign allies, indicating that their systems also are not meeting goals. A combination of supply-chain issues and internal delays caused the Missile Defense Agency to miss delivery targets for a host of batteries and ground-based interceptors, one of which "was 3 years overdue." Radar and sensor upgrades also have posed a challenge for the agency....

All told, the Missile Defense Agency "conducted less than half of its planned fiscal year 2022 testing," including flight and ground tests that demonstrate whether or not the nation's defense system can adequately fend off a missile barrage. The agency also reduced the scope of cyber assessments and delayed others for "future years," setting America's missile defense systems even further behind. As the Missile Defense Agency falls short of its goals, America's enemies are forging ahead. Over the past year, China doubled the number of missiles in its arsenal capable of hitting the U.S., according to the Pentagon.

The two NGP satellites, operating in highly elliptical orbits, are designed to detect and track ballistic and hypersonic missiles over the Northern Hemisphere. Broad coverage over the polar region offers the highest probability of spotting potential missile launches. NGP can identify the infrared heat signatures of incoming threats and transmit this mission data to the ground.

China has more than 50 operational nuclear power units with 24 more under construction. By 2035, China's nuclear power generation will account for 10% of its electricity generation…. The agreements signed with CAEA seek to strengthen cooperation on small modular reactors, nuclear fusion, nuclear data, fuel cycle & waste management, as well as communication activities.

Source: https://freebeacon.com/national-security/americas-missile-defense-system-is-in-tatters-government-report-finds/, 23 May 2023.

Northrop Grumman on Track to Produce Early-Warning Missile Defense Program

Northrop Grumman Corporation (NYSE: NOC) recently completed a Preliminary Design Review (PDR) for the U.S. Space Force Space Systems Command's Next Generation Overhead Persistent Infrared Polar (NGP) program. The company is on track to begin production of the early-warning missile system in defense of the nation. The design review establishes the company's technical approach for the full integration of the Eagle-3 spacecraft with the infrared sensor, auxiliary and high-bandwidth communication payloads being developed at our Northrop Grumman site in Azusa, California. "Northrop Grumman is on an accelerated path to delivering an early-warning missile system capable of surviving attacks from space, ground or cyber elements"…. "NGP satellites will maintain a direct line of communication back to the continental U.S, limiting dependency on overseas ground station sites."

The two NGP satellites, operating in highly elliptical orbits, are designed to detect and track ballistic and hypersonic missiles over the Northern Hemisphere. Broad coverage over the polar region offers the highest probability of spotting potential missile launches. NGP can identify the infrared heat signatures of incoming threats and transmit this mission data to the ground. Based on the threat, decision-makers can then make responsive and informed decisions. This enhanced communication system also has resiliency features that reduce vulnerabilities to counter-space and cyberattacks….

Source: https://news.northropgrumman.com/news/releases/northrop-grumman-on-track-to-produce-early-warning-missile-defense-program, 24 May 2023.

NUCLEAR ENERGY

CHINA

Agreements Signed During First Official Visit to China by IAEA's Grossi

IAEA Director General Grossi and other IAEA officials have signed several agreements at the China Atomic Energy Authority (CAEA), during Grossi's first official visit to China. Grossi met with several high-level officials and visited nuclear facilities and institutions in Beijing, Shanghai and Shandong. "China is one of the IAEA's most important partners and a global leader in nuclear energy"…. The talks covered cooperation in

nuclear applications and indispensable exchanges on non-proliferation and nuclear safety.

China has more than 50 operational nuclear power units with 24 more under construction. By 2035, China's nuclear power generation will account for 10% of its electricity generation.... The agreements signed with CAEA seek to strengthen cooperation on small modular reactors, nuclear fusion, nuclear data, fuel cycle & waste management, as well as communication activities. An agreement was also signed in support of Rays of Hope, the IAEA initiative to promote cancer care by improving availability of radiotherapy services, medical imaging and nuclear medicine....

China, a member of the IAEA since 1984, is involved in 93 IAEA technical cooperation projects spanning national, regional and interregional activities as well as 49 coordinated research projects. During the visit, Director General Grossi designated China's Nuclear & Radiation Safety Centre as an IAEA Collaborating Centre. China already hosts two other IAEA Collaborating Centres: the Chinese Academy of Agriculture Sciences (CAAS) for research, development & capacity building of nuclear techniques in food and agriculture, and the CAEA for research, development, testing & training on nuclear security detection and physical protection technologies. Director General Grossi visited China's State Nuclear Security Technology Centre accompanied by Liu Jing, Deputy Director of the CAEA. "Nuclear security is an essential component for the successful development of nuclear energy. China's State Nuclear Security Technology Centre and the IAEA will further strengthen our collaboration, in particular with IAEA's nuclear security centre in Seibersdorf".... The Centre is part of the International Network for Nuclear Security Training and Support Centres (NSSC Network), which is coordinated by the IAEA and plays a key role in international cooperation and the sharing of best practices in nuclear security.

At the China Institute of Atomic Energy (CIAE), the main research institute of the China National Nuclear Corporation, Director General Grossi met with researchers and discussed the role of nuclear technology to address current challenges. "CIAE showcases impressive developments of nuclear technology in China, including the advanced research reactor and proton cyclotron".... Talks were also held with China's Ministry of Foreign Affairs, Ministry of Ecology & Environment, and the China International Development Cooperation Agency. Director General Grossi also visited Tsinghua University, Peking Union Medical College Hospital and the Shidao Bay Nuclear Power Plant, among other nuclear facilities and institutions. Chinese State Councillor and Foreign Minister Qin Gang during talks with Director General Grossi, urged the IAEA to perform its duties in an objective, fair and professional manner. He said he hoped IAEA would properly handle the nuclear submarine cooperation between the US, the UK and Australia as well as the Japan's plans to dispose of treated nuclear-contaminated water to the sea....

Director General Grossi in turn said the Agency is willing to deepen cooperation with China and is committed to preventing nuclear proliferation, respecting member states' decisions, and will remain neutral and conduct relevant consultations on US-UK-Australia nuclear submarine cooperation in a transparent manner.

Foreign Minister Qin called on the IAEA to resolutely resist actions stretching national security and interfering with and undermining the normal order of international cooperation. ...Qin told Director General Grossi that China's cooperation with the IAEA has solid foundation and good prospects. He said China supported the IAEA's playing a greater role in global governance in the nuclear field and making new contributions to reform and improve the global nuclear governance system. Director General Grossi in turn said the Agency is willing to deepen cooperation with China and is committed to preventing nuclear proliferation, respecting member states' decisions, and will remain neutral and conduct relevant consultations on US-UK-Australia nuclear submarine

cooperation in a transparent manner. He also made it clear that the IAEA will not endorse any country's decision to dump nuclear-contaminated water into the sea and will not agree to any activities that violate international safety standards.

Source: https://www.neimagazine.com/news/newsagreements-signed-during-first-official-visit-to-china-by-iaeas-grossi-10884614, 25 May 2023.

Stated that the proposed 15 MW offshore wind farm with three NREL 5 MW turbines supported by monopile foundations at the Kalpakkam area could potentially act as the additional emergency backup power source for meeting the cooling power requirements of existing nuclear power plants.

IIT Jodhpur-led-Team Proposes Using Wind Energy as Nuclear Coolant

An international team led by researchers at the IIT Jodhpur has proposed offshore wind farms as seismically resilient alternative power sources to help prevent disasters in nuclear power plants. The researchers demonstrated the feasibility of strengthening the reliability of cooling power by utilising sustainable wind power, at the Madras Atomic Power Station in Chennai....

The proposed methodology, published in an article in the journal *Nuclear Engineering and Design*, involves a series of stages. It commences with the estimation of coolant power needs in nuclear reactors, followed by the design of an offshore wind turbine and its corresponding infrastructure. Finally, a seismic safety evaluation was conducted on the selected offshore wind turbine site, considering different scenario levels. The researchers, who are from the University of Surrey in the UK, Tsinghua University as well as The Institute of Engineering Mechanics in China, and IIT Jodhpur stated that the proposed 15 MW offshore wind farm with three NREL 5 MW turbines supported by monopile foundations at the Kalpakkam area could potentially act as the additional emergency backup power source for meeting the cooling power requirements of existing nuclear power plants.

The offshore wind turbine monopile foundation was analysed under anticipated dynamic loading conditions considering the soil nonlinearity and seismic liquefaction employing state-of-the-art numerical models. The nonlinear integrated seismic analyses conducted on the proposed offshore wind turbines depicted acceptable seismic performance on comparing the monopile midline displacements and bending moments. ..."This suggested approach serves as an excellent framework for evaluating the seismic resilience of nuclear power plants and the integration of wind energy sources during interconnected events like earthquakes and tsunamis."...

Source: https://www.edexlive.com/news/2023/may/22/iit-jodhpur-led-team-proposes-using-wind-energy-as-nuclear-coolant-35367.html, 22 May 2023.

JAPAN

Japanese Firms Invest in Maritime Nuclear Developer Core Power

More than a dozen Japanese companies have invested a combined total of about USD80 million in the UK-based Core Power, which is helping develop a floating molten salt reactor (MSR) nuclear power plant and other maritime applications.... The companies include Onomichi Dockyard and Imabari Shipyard, according to Nikkei. Its report, which has been highlighted on Core Power's website, says the Japanese companies "have subscribed to a third-party allocation of new shares by Core Power - the British company raised about USD100 million

More than a dozen Japanese companies have invested a combined total of about USD80 million in the UK-based Core Power, which is helping develop a floating molten salt reactor (MSR) nuclear power plant and other maritime applications.... The companies include Onomichi Dockyard and Imabari Shipyard, according to Nikkei.

and is now majority-owned by Japanese companies".

A multinational team including Core Power, Southern Company, TerraPower and Orano USA are part of the Molten Chloride Reactor Experiment which aims to see the "world's first fast-spectrum salt reactor achieve criticality", to be built at Idaho National Laboratory, backed by US Department of Energy (DOE) funding. In 2022, Core Power, MIT Energy Initiative and Idaho National Laboratory were granted research funding by the US DOE's Nuclear Energy University Program, a three-year study into the development of offshore floating nuclear power generation in the USA.

An MSR cannot melt-down, because the fuel is already liquid and since the fuel is locked into the coolant, toxic radioisotopes which are formed in the fission process cannot escape into the environment in the event of an accident". Floating nuclear power plants are seen as having future growth potential because they provide flexible location options, being placed at sea from where they can provide electricity or hydrogen or water desalination for onshore use and Core Power says its aim is also to produce "a competitive true-zero emission power system for the future of maritime by 2030".

Core Power has stressed the safety benefits of molten salt reactors noting that the fuel and the coolant are mixed in a fuel-salt which is liquid at high temperatures and "using a liquid fuel where the fuel and coolant are the same, has immense implications on the safety of the reactor system, as a loss of coolant accident is impossible. An MSR cannot melt-down, because the fuel is already liquid and since the fuel is locked into the coolant, toxic radioisotopes which are formed in the fission process cannot escape into the environment in the event of an accident".

As Core Power Chairman and CEO Mikal Bøe put it in a World Nuclear News interview in 2021: "A ship may be lost at sea and may sink to 8000 metres on the ocean floor, but even then, it would not pollute the environment" with the MSR fuel "cooling until it's a solid rock and that solid rock should be entombed inside the reactor vessel". Floating nuclear power plants are seen as having future growth potential because they provide flexible location options, being placed at sea from where they can provide electricity or hydrogen or water desalination for onshore use and Core Power says its aim is also to produce "a competitive true-zero emission power system for the future of maritime by 2030".

Source: https://www.world-nuclear-news.org/Articles/Japanese-firms-invest-in-Core-s-floating-nuclear-p, 24 May 2023.

UAE

UAE Commits $275 Million for Landmark Nuclear Energy Project

UAE has pledged its support, along with partners from the U.S., Japan, and South Korea, to invest up to $275 million in nuclear energy projects in Romania. The UAE's contribution, facilitated by the Emirates Nuclear Energy Corporation (ENEC), will be directed towards the deployment of a NuScale SMR in Romania. Leveraging its expertise in constructing and operating light water reactors, ENEC will assist with crucial aspects such as procurement, engineering, and project management. This announcement, made by U.S. President Biden during the G7 Summit in Japan, marks the first major initiative under the Partnership for Accelerating Clean Energy (PACE), a global effort to promote clean energy adoption. PACE was launched at COP27 in Egypt in November 2022, with the aim of mobilising $100 billion in financing, investments, and other forms of support to deploy 100 new gigawatts of clean energy capacity by 2035.

The UAE's contribution, facilitated by the Emirates Nuclear Energy Corporation (ENEC), will be directed towards the deployment of a NuScale SMR in Romania. Leveraging its expertise in constructing and operating light water reactors, ENEC will assist with crucial aspects such as procurement, engineering, and project management.

As a result of decades of collaboration in the energy sector, the UAE and the U.S established PACE to accelerate the energy transition globally, fostering economic opportunities and promoting innovative projects and technologies. The SMR project in Romania will replace a coal plant and provide reliable, clean baseload energy, thereby reducing emissions in heavy-industrial sectors and supporting sustainable economic development. "As a global leader in large-scale nuclear programs, the UAE brings its expertise to support the deployment of advanced nuclear technologies in Romania"…. "ENEC will contribute through the sharing of knowledge, personnel, and technical capabilities, further solidifying its role as a key player in the international nuclear energy landscape."

The SMR project in Romania will replace a coal plant and provide reliable, clean baseload energy, thereby reducing emissions in heavy-industrial sectors and supporting sustainable economic development. "As a global leader in large-scale nuclear programs, the UAE brings its expertise to support the deployment of advanced nuclear technologies in Romania".

ENEC recently signed an MOU with NuclearElectrica in Romania to explore opportunities in advanced nuclear technologies, and related activities for development, deployment, and financing, demonstrating ENEC's commitment to supporting Romania with these key national infrastructure programs to secure its clean energy transition. The UAE has delivered one of the most ambitious energy transitions in modern history with key investments in solar and the delivery of the Barakah Nuclear Energy Plant. Today, Barakah is the largest provider of clean electricity and green certificates in the UAE and the Arab world, generating 30TWh of carbon-free electricity per year from three units, with a total of 40TWh annually with the addition of Unit 4.

Source: https://www.utilities-me.com/news/uae-commits-275-million-for-landmark-nuclear-energy-project, 25 May 2023.

SMALL MODULAR REACTORS

INDIA

India Working on Small Modular Reactors: Jitendra Singh

India is working on new technologies such as the small modular reactors that can be factory-built and help make clean energy transition, Science and Technology Minister Jitendra Singh said. Minister Singh…also said the government had opened up the nuclear power sector for joint ventures with public sector undertakings but not for the private sector. SMR, with up to 300 MW capacity are flexible in design and require a smaller footprint. Being mobile and agile technology, SMR can be factory-built unlike the conventional nuclear reactors that are built onsite. A recent NITI Aayog report said, as many SMR designs were under various stages of research, development and licensing in different countries, global regulatory harmonisation, developing the manufacturing ecosystem and bringing in public as well as private capital would be the key for growth of the SMR industry. "We are already working on it. I think as times come, we have to move with the global world. SMR may become the order of the day. We are open to these new technologies, and we are also adapting to them very fast."...

We are already working on it. I think as times come, we have to move with the global world. SMR may become the order of the day. We are open to these new technologies, and we are also adapting to them very fast.

The minister said for the first time, the Modi government had approved a proposal to build 10 nuclear reactors under "fleet mode". The state-run NPCIL builds and operates almost all of the atomic power plants in the country. In 2015, the government amended the Atomic Energy Act to enable joint ventures between the NPCIL and public sector companies to build nuclear power projects. "Earlier, they were not partnering with

anybody. So, we naturally had constraints on resources, finances. Now, we already have two important partnerships with Indian Oil Corporation and NTPC. We have moved in that direction, though not yet with the private."...

Earlier in May 2023, the NPCIL signed a supplementary joint venture agreement with NTPC to develop two 700 MW PHWR at Chutka in Madhya Pradesh and four 700 MW PHWRs at Mahi Banswara in Rajasthan. The NPCIL has also formed joint ventures with Indian Oil Nuclear Energy and Nalco Power Company Limited for expansion of the nuclear power sector. India's current installed nuclear power capacity is 6780 MW and it plans to add 21 more atomic power generating units with a total installed capacity of 15,700 MW by 2031.

Earlier in May 2023, the NPCIL signed a supplementary joint venture agreement with NTPC to develop two 700 MW PHWR at Chutka in Madhya Pradesh and four 700 MW PHWRs at Mahi Banswara in Rajasthan. The NPCIL has also formed joint ventures with Indian Oil Nuclear Energy and Nalco Power Company Limited for expansion of the nuclear power sector.

The plant will save the emission of 1.7 million tonnes of carbon dioxide per year compared with natural gas-based fertiliser production. "The outlook of contributing to better food conditions for 45 million people in Indonesia while leaving a very limited carbon footprint is absolutely amazing.

Source: https://economictimes.indiatimes.com/industry/energy/power/india-working-on-small-modular-reactors-jitendra-singh/printarticle/100448604.cms, 23 May 2023.

NUCLEAR COOPERATION

DENMARK–INDONESIA

Danish Companies Sign MOU on Nuclear Deal with Indonesia

Four Danish companies – Topsoe, Alfa Laval, Copenhagen Atomics and Aalborg CSP – have entered into a memorandum of understanding with ammonia producer Pupuk Kaltim and Pertamina NRE (both of which are owned by the Indonesian state) to build a facility that will produce one million tonnes of ultra-low-emission ammonia per year. The new plant, based in the city of Bontang, will create fertiliser for the production of food that can feed 45 million people, approximately one-sixth of the Indonesian population. The final examinations will be completed over the next six months, as will the mapping of the legal landscape.

The plant will save the emission of 1.7 million tonnes of carbon dioxide per year compared with natural gas-based fertiliser production. "The outlook of contributing to better food conditions for 45 million people in Indonesia while leaving a very limited carbon footprint is absolutely amazing."... "This is a very promising and progressive project, and we are excited to be able to support with our world-class power-to-X competencies."

Danish Nuclear Power Behind Indonesia Plant: The most innovative aspect of the facility is that it will be powered by nuclear power from Copenhagen Atomics, which is involved in the global race to supply small, modular nuclear reactors that are expected to become an important part of the world's future energy supply. The 1GW nuclear power plant will run for 50 years, with the facility expected to open in 2028. The project will be among the first featuring Copenhagen Atomics' modular molten salt thorium reactors.

In addition to ammonia synthesis, Topsoe will supply newly developed electrolysis cell technology called SOEC, which makes the production of hydrogen significantly more efficient and cheaper. Hydrogen plays a key part in the production of ammonia. Meanwhile, Alfa Laval will deliver heat exchangers to optimise the energy balance of the plant, as well as desalination to produce ultra-pure water for the electrolysis process. Last, Aalborg CSP will design and supply the thermal energy storage systems and molten salt-based steam boilers.

... Although the finances of the overall project have not yet been finalised, construction is expected to cost around $4bn, plus operational and maintenance fees for the plant. During the plant's lifetime, it will produce ammonia worth $25bn, at today's prices. The ammonia from the plant can also be used as carbon-free marine e-fuel, something that could be of particular use to Indonesia since it is one of the major trade routes for international shipping traffic. The facility will be extremely competitive on the market for ultra-low-emission ammonia, which is central to reducing the carbon footprint of the agriculture and shipping industries. ...

Source: https://www.investmentmonitor.ai/news/danish-companies-sign-mou-on-nuclear-deal-with-indonesia/, 22 May 2023.

URANIUM PRODUCTION

MONGOLIA

Emmanuel Macron Supports Controversial Uranium Mining During Official Visit

Emmanuel Macron is the first sitting French president to set foot on Mongolian soil since the establishment of diplomatic relations in 1965 between the two countries. Mongolian President Khürelsükh welcomed Macron with a grand ceremony, to a country almost three times the size of France but with a population of only 3.3 million. It is no coincidence that President Macron stopped off in Ulaanbaatar, the capital. He is making every effort to reach out to countries that have not clearly condemned Russia's war in Ukraine.

President Macron could see this as an opportunity to consolidate relations with countries bordering Russia, as he did recently when he welcomed the Uzbek and Kazakh presidents to Paris. Paris announced that it wanted to "loosen the constraint on Russia's neighbours and give them a choice of options". Mongolia is landlocked between Russia and China and remains dependent in terms of exports, 86% of which end up in China. Since the war in Ukraine, France has sought to detach itself from Russia to obtain uranium supplies by diversifying its imports among several countries, such as Kazakhstan, Niger and Australia. Mongolia is next on France's list of suppliers.

France consumes about 7,000 tonnes of natural uranium per year to produce 40% of its energy. It is estimated the Mongolian mines would be in operation for the next three decades, employing 800 local workers. The problem is that local populations don't approve of this project, which "brings a lot of bitterness"....The Mongolians respect the "mother earth", which they consider sacred.

The French nuclear group Orano (formerly Areva) has been operating in Mongolia since 1997 with several natural uranium mining projects. Uranium exports to France are still insignificant, but Orano has a significant presence in Mongolia, where it is working with state-owned companies to exploit deposits in the Gobi desert in the southeast of the country. The two heads of state have committed to accelerating the development of two uranium deposits: Dulaan Uul and Zoovch Ovoo, whose resources are estimated at 64,000 tonnes. France consumes about 7,000 tonnes of natural uranium per year to produce 40% of its energy. It is estimated the Mongolian mines would be in operation for the next three decades, employing 800 local workers. The problem is that local populations don't approve of this project, which "brings a lot of bitterness"....The Mongolians respect the "mother earth", which they consider sacred...

In 2018, Orano had been targeted by a judicial investigation by the French Parquet national financier (PNF) for suspicions of "bribery of a foreign public official" in Mongolia. Eurotradia International, the consulting firm that played a decisive role in the authorisation of uranium mining in the Gobi desert, is suspected of corruption by PNF. Orano has since announced that it is "terminating the contracts with Eurotradia". The management of the country's oil and mining resources has been plagued by endemic corruption for years. In December 2022, thousands of people marched in the capital accusing MPs and

company executives of embezzlement after the revelation that one million tonnes of coal had been misappropriated over nine years.

President Macron's visit brought "something very joyful but marked by a commercial state of mind"…recorded serious health incidents among local populations living around the mine operating sites in Mongolia. With a group of Mongolian citizens…filed a complaint in 2018 against Badrakh Energy, Orano's subsidiary in Mongolia. The plaintiffs claim that mining has caused, among other things, malformations in livestock, cancers and miscarriages. Orano insists that its "in-situ leaching" (ISL) extraction method is "safe for humans and the environment". The French Sortir du Nucléaire network of associations has criticised this extraction method, which injects "enormous quantities of sulphuric acid into the ground, hundreds of tonnes to extract one tonne of uranium". They say this could contaminate the wells used in this desert region by the population.

Euronews was given access to documents from the legal proceedings which appear to indicate that wells near Orano's facilities have been contaminated with strontium and arsenic. Orano replied to Euronews in an email saying that the groundwater in the area "is unfit for human consumption […] due to its natural chemical composition". "The poor quality of the water was recorded in the pilot area long before the first Badrakh Energy operations began"…Orano also explains that it commissioned the independent international organisation Stantec to conduct a study, which concluded that "the uranium mine project has no negative impact on the environment, human and livestock health." The plaintiffs are now seeking an independent expert opinion that may or may not prove, at trial, the link between the uranium mines and the health problems observed in their vicinity. The Mongolian embassy in Paris was unable to respond to Euronews' interview requests.

Orano also explains that it commissioned the independent international organisation Stantec to conduct a study, which concluded that "the uranium mine project has no negative impact on the environment, human and livestock health." The plaintiffs are now seeking an independent expert opinion that may or may not prove, at trial, the link between the uranium mines and the health problems observed in their vicinity.

Source: Gael Camba, https://uk.news.yahoo.com/mongolia-emmanuel-macron-supports-controversial-133656983.html?guce_referrer=...&guccounter=2, 24 May 2023.

NUCLEAR PROLIFERATION

IRAN

Israel Concerned Iran will Begin Enriching Uranium to Near Weapons-Grade Purity

Several weeks ago, Tehran made a sudden jump to 84% uranium enrichment, only to later claim it made a mistake and return to the original 63% purity level. Out of fear that this might happen again, Israel's top political and security brass – PM Netanyahu, Defense Minister Gallant, IDF Chief of Staff Lt. Gen. Halevi, and other high-ranking military officials – held several meetings this week to discuss the implications of the development and warned Tehran against the move. The officials made it clear that Israel was prepared to use its military power if it believed the circumstances warranted it.

Tehran made a sudden jump to 84% uranium enrichment, only to later claim it made a mistake and return to the original 63% purity level. Out of fear that this might happen again, Israel's top political and security brass held several meetings this week to discuss the implications of the development and warned Tehran against the move.

…An unnamed Iranian official responded to the Israeli threat, saying that any damage inflicted on the regime's nuclear facilities would be tantamount "to declaring a widespread war for

which Israel will bear responsibility." He also accused Israel of trying to project strength while going through an internal crisis, perhaps alluding to the judicial reform that has become a source of contention in Israeli society. He said that Israel's alleged increased strikes in Syria prove that the country is "the basis of insecurity and stability in the region. The world must understand that there will be no red lines in our response against Israel. Israel's words are official terrorism, which is met with international silence."

Source: https://www.israelhayom.com/2023/05/24/israel-concerned-iran-will-begin-enriching-uranium-to-near-weapons-grade-purity/, 24 May 2023.

Iran's Nuclear Chief Says Tehran to Cooperate with Inspectors on 'New Activities'

The head of Iran's nuclear program insisted on May 21 that his government would cooperate with international inspectors on any "new activities." His statement followed an exclusive Associated Press report about Tehran's new underground tunnel system near a nuclear enrichment facility...how deep inside a mountain, the new tunnels near the Natanz facility are likely beyond the range of a last-ditch U.S. weapon designed to destroy such sites.

The report sparked wider conversation across the Middle East about the construction, with Israel's national security adviser saying on May 20 the site would not be immune from attack even if its depth put it out of range of American airstrikes. Speaking to journalists on May 21 after a Cabinet meeting, Mohammad Eslami of the Atomic Energy Organization of Iran sought to describe the interest in the site as a case of Israel feeling pressured. "The Islamic Republic of Iran is working under the IAEA safeguards, and whenever wants to start new activities, it will coordinate with the IAEA, and acts accordingly."...

The IAEA did not respond to questions from the AP about the construction at Natanz, about 225 kms (140 miles) south of Tehran. Natanz has been a point of international concern since its existence became known two decades ago. Satellite photographs of the piles of dirt from the digging and experts who spoke to the AP suggest the new tunnels will be between 80 meters (260 feet) and 100 meters (328 feet) deep. Such underground facilities led the U.S. to create the GBU-57 bomb, which can plow through at least 60 meters (200 feet) of earth before detonating....

It is not clear that such a one-two punch would damage a facility as deep as the one at Natanz. With such bombs potentially off the table, the U.S. and its allies are left with fewer options to target the site. If diplomacy remains stalled as it has for months over Iran's tattered nuclear deal, sabotage attacks may resume.

U.S. officials reportedly have discussed using two such bombs in succession to ensure a site is destroyed. It is not clear that such a one-two punch would damage a facility as deep as the one at Natanz. With such bombs potentially off the table, the U.S. and its allies are left with fewer options to target the site. If diplomacy remains stalled as it has for months over Iran's tattered nuclear deal, sabotage attacks may resume. Iran says the new construction will replace an above-ground centrifuge manufacturing center at Natanz struck by an explosion and fire in July 2020. Tehran blamed the incident on Israel, long suspected of running sabotage campaigns against its program.

Source: https://abcnews.go.com/Technology/wireStory/after-ap-report-irans-nuclear-chief-tehran-cooperate-99562281, 24 May 2023.

NUCLEAR DISARMAMENT

G7 Leaders' Hiroshima Vision on Nuclear Disarmament

We, the Leaders of the G7, met at a historical juncture in Hiroshima, which together with Nagasaki offers a reminder of the unprecedented devastation and immense human suffering the people of Hiroshima and Nagasaki experienced as a result of the atomic bombings of 1945. In a solemn and reflective moment, we reaffirm, in this first G7 Leaders' document with a particular focus on nuclear disarmament, our commitment to achieving a world without nuclear weapons with

undiminished security for all. We underscore the importance of the 77-year record of non-use of nuclear weapons. Russia's irresponsible nuclear rhetoric, undermining of arms control regimes, and stated intent to deploy nuclear weapons in Belarus are dangerous and unacceptable. We recall the statement in Bali of all G20 leaders, including Russia.

In a solemn and reflective moment, we reaffirm, in this first G7 Leaders' document with a particular focus on nuclear disarmament, our commitment to achieving a world without nuclear weapons with undiminished security for all. We underscore the importance of the 77-year record of non-use of nuclear weapons.

In this context, we reiterate our position that threats by Russia of nuclear weapon use, let alone any use of nuclear weapons by Russia, in the context of its aggression against Ukraine are inadmissible. We recall the Joint Statement of the Leaders of the Five Nuclear-Weapon States issued on January 3, 2022, on Preventing Nuclear War and Avoiding Arms Races, and affirm that a nuclear war cannot be won and must never be fought. We call on Russia to recommit – in words and deeds – to the principles enshrined in that Statement. Our security policies are based on the understanding that nuclear weapons, for as long as they exist, should serve defensive purposes, deter aggression and prevent war and coercion.

The NPT must be upheld as the cornerstone of the global nuclear non-proliferation regime and the foundation for the pursuit of nuclear disarmament and peaceful uses of nuclear energy. We reaffirm our commitment to the ultimate goal of a world without nuclear weapons with undiminished security for all, achieved through a realistic, pragmatic and responsible approach.

The overall decline in global nuclear arsenals achieved since the end of the Cold War must continue and not be reversed. The NPT must be upheld as the cornerstone of the global nuclear non-proliferation regime and the foundation for the pursuit of nuclear disarmament and peaceful uses of nuclear energy. We reaffirm our commitment to the ultimate goal of a world without nuclear weapons with undiminished security for all, achieved through a realistic, pragmatic and responsible approach. In this regard, Japan's "Hiroshima Action Plan" is a welcome contribution. We deeply regret Russia's decision to undermine the New START Treaty, and call on Russia to enable a return to full implementation of the Treaty. At the same time, China's accelerating build-up of its nuclear arsenal without transparency nor meaningful dialogue poses a concern to global and regional stability.

We emphasize the importance of transparency with regard to nuclear weapons and welcome actions already taken by the U.S, France and the U.K to promote effective and responsible transparency measures through providing data on their nuclear forces and the objective size of their nuclear arsenal. We call on nuclear-weapon States that have not yet done so to follow suit. To promote transparency, we also call on nuclear-weapon States that have yet to do so to engage with non-nuclear-weapon States in a meaningful dialogue on transparency regarding their nuclear arsenals and limiting nuclear competition, including through an open explanation of national reports coupled with an interactive discussion with non-nuclear-weapon States and civil society participants at future NPT related meetings.

In this regard, we stress the benefit of pre-notification of relevant strategic activities, as a substantial contribution to risk reduction. The G7 recognizes the need for concrete steps by nuclear-weapon States to reduce strategic risks. We call on China and Russia to engage substantively in relevant multilateral and bilateral forums, in line with their obligations under the NPT, including Article VI.

We call for the immediate commencement of long overdue negotiations of a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices. 2023 will mark the 30th year since the consensual adoption of a UNGA resolution calling for a FMCT, and we urge all countries to refocus political attention towards the FMCT as a priority action

to forestall a recurrence of the nuclear arms race, including any and all independent or complementary efforts. In this regard, we call on all states that have not yet done so to declare and maintain voluntary moratoria on the production of fissile material for use in nuclear weapons or other nuclear explosive devices.

We call for the immediate commencement of long overdue negotiations of a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices. 2023 will mark the 30th year since the consensual adoption of a UNGA resolution calling for a FMCT, and we urge all countries to refocus political attention towards the FMCT as a priority action to forestall a recurrence of the nuclear arms race, including any and all independent or complementary efforts.

We are resolute in our view that no nation should carry out any nuclear weapon test explosion or other nuclear explosion, condemn any threats to do so, and emphasize that bringing the CTBT into force is another urgent matter. We remain committed to upholding the global norm against nuclear explosive testing until it is legally binding and call on all states to declare new or maintain existing moratoriums on nuclear weapon test explosions or any other nuclear explosions. We express our concern over Russia's announcement of its readiness to conduct a nuclear test, and we call for Russia's adherence to its moratorium on nuclear tests.

A world without nuclear weapons cannot be achieved without nuclear non-proliferation. We reiterate our unwavering commitment to the goal of North Korea's complete, verifiable, and irreversible abandonment of its nuclear weapons and existing nuclear programs, and any other WMD and ballistic missile programs in accordance with relevant UNSCRs.

We further underscore the essential role of the CTBTO Preparatory Commission in detecting and reporting suspected nuclear explosions worldwide. The G7, collectively, has supported the CTBTO's activities in the amount of more than 100 million US dollars in 2023. We reaffirm the G7's commitment to providing sufficient resources to ensure the continued operation and the long-term sustainability of all elements of the CTBT verification system and call on others to do the same.

A world without nuclear weapons cannot be achieved without nuclear non-proliferation. We reiterate our unwavering commitment to the goal of North Korea's complete, verifiable, and irreversible abandonment of its nuclear weapons and existing nuclear programs, and any other WMD and ballistic missile programs in accordance with relevant UNSCRs. We demand North Korea refrain from any other destabilizing or provocative actions, including any further nuclear tests or launches that use ballistic missile technology. North Korea cannot and will never have the status of a nuclear-weapon State under the NPT. It is critical that sanctions be fully and scrupulously implemented by all states and remain in place for as long as North Korea's WMD and ballistic missile programs exist.

We remain deeply concerned about Iran's unabated escalation of its nuclear program, which has no credible civilian justification and brings it dangerously close to actual weapon-related activities. We reiterate our clear determination that Iran must never develop a nuclear weapon and we call on all countries to support the implementation of UNSCR 2231. We urge Iran to cease nuclear escalations. We call on Iran to fulfill its legal obligations and political commitments regarding nuclear non-proliferation without further delay. A diplomatic solution remains the best way to resolve international concerns regarding Iran's nuclear program. In that context, the Joint Comprehensive Plan of Action continues to provide a useful reference. We call on Iran to uphold its safeguards obligations and stated commitments with prompt and concrete action. We commend and continue to fully support the IAEA's crucial mandates and efforts in Iran.

In these times of uncertainty and tension, it is of paramount importance to preserve, resource and strengthen existing regimes and other global efforts. We urge all states to take their responsibilities seriously to meet the highest standards of safeguards, safety, and security in promoting the peaceful uses of nuclear energy, science, and technology, including those related to the deployment of next-generation nuclear technologies. We further express our profound concern over Russia's attempt to control Ukraine's nuclear facilities, which poses serious nuclear safety and security risks and is in total disregard of Ukraine's right under the NPT to pursue peaceful uses of nuclear energy. We reaffirm the importance of the implementation of the highest standards of safeguards of the IAEA and the universal adoption of the Additional Protocol (AP) as fundamental components of the nuclear non-proliferation regime.

We will promote a reliable and responsible nuclear supply chain, in accordance with the highest standards of nuclear non-proliferation, including the application of the AP. We support further discussions within the NSG towards the establishment of the AP as a condition of supply in the Group's guidelines. Those G7 countries which opt for nuclear power, or related peaceful nuclear applications, recognize that the use of nuclear energy, science, and technology contributes to providing affordable low-carbon energy.

We will promote a reliable and responsible nuclear supply chain, in accordance with the highest standards of nuclear non-proliferation, including the application of the AP. We support further discussions within the NSG towards the establishment of the AP as a condition of supply in the Group's guidelines. Those G7 countries which opt for nuclear power, or related peaceful nuclear applications, recognize that the use of nuclear energy, science, and technology contributes to providing affordable low-carbon energy.

The G7 notes the contribution of nuclear technology applications, in such fields as medicine or isotope hydrology, to promoting prosperity and addressing the UN Sustainable Development Goals. We reiterate our utmost commitment to the G7-led Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, which for more than 20 years has delivered concrete impactful programming to advance nuclear non-proliferation in every part of the world.

We emphasize that the transparency of the management of civil plutonium must be maintained. We oppose any attempt to produce or support the production of plutonium for military programs under the guise of civilian programs, which undermines the objectives of the NPT including the promotion of peaceful uses of nuclear energy. In this regard, we underscore the importance of the implementation of the Guidelines for the Management of Plutonium (INFCIRC 549). We call on all states that committed to reporting annually their holdings of all plutonium in peaceful nuclear activities to the IAEA to fulfill those commitments. We recognize the need to manage civil stocks of highly enriched uranium with the same sense of responsibility as the plutonium covered by these guidelines. We also commit to prioritizing efforts to reduce the production and accumulation of weapons-usable nuclear material for civil purposes around the world.

Achieving the world we hope to see requires a global effort to take us from the harsh reality to the ideal, no matter how narrow the path may be. In this regard, we underscore the importance of disarmament and non-proliferation education and outreach. We encourage other leaders, youth and people from around the world to visit Hiroshima and Nagasaki to raise and sustain awareness of the realities of nuclear weapons use one can witness in Hiroshima and Nagasaki.

Achieving the world we hope to see requires a global effort to take us from the harsh reality to the ideal, no matter how narrow the path may be. In this regard, we underscore the importance of

disarmament and non-proliferation education and outreach. We encourage other leaders, youth and people from around the world to visit Hiroshima and Nagasaki to raise and sustain awareness of the realities of nuclear weapons use one can witness in Hiroshima and Nagasaki.

To this end, we welcome initiatives such as the "Youth Leader Fund for a World without Nuclear Weapons" by Japan, the "Young Professionals Network" of P5, the "Youth Champions for Disarmament" financed by Germany, and the "Young Women Next Generation Initiative" established by the EU Non-Proliferation and Disarmament Consortium, as well as other initiatives that support the full, equal, and meaningful participation of women in addition to the engagement of civil society in disarmament and non-proliferation processes.

Source: https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/19/g7-leaders-hiroshima-vision-on-nuclear-disarmament/, 19 May 2023.

The programme is aimed at equipping the leaders of the future with the knowledge, skills and network to join global efforts to eliminate nuclear arms — the most dangerous weapons on Earth. Although nuclear weapons have only been used twice in warfare — in the bombings of Hiroshima and Nagasaki in 1945 — about 12,500 reportedly remain in our world today and there have been over 2,000 nuclear tests conducted to date.

UN Seeking Young, Future Leaders to Join New Global Training Programme for World Free of Nuclear Weapons

The United Nations Office for Disarmament Affairs and the Government of Japan are calling on young people to apply for an innovative learning programme that will empower them to make their contribution to a world free of nuclear weapons. Applications are now open for a new global training programme called the "Youth Leader Fund for a World Without Nuclear Weapons". The training programme, run by the Office for Disarmament Affairs and made possible by the generous financial contribution of Japan, offers up to 100 scholarships for young people aged 18 and older.

The programme is aimed at equipping the leaders of the future with the knowledge, skills and network to join global efforts to eliminate nuclear arms — the most dangerous weapons on Earth. Although nuclear weapons have only been used twice in warfare — in the bombings of Hiroshima and Nagasaki in 1945 — about 12,500 reportedly remain in our world today and there have been over 2,000 nuclear tests conducted to date. One nuclear weapon can destroy a whole city, potentially killing millions, and jeopardizing the natural environment and lives of future generations through its long-term catastrophic effects.

The programme is seeking youth who are motivated to use their talents to promote change for a more peaceful and secure world — without nuclear weapons. The intention is to bring together an eclectic and geographically diverse group of advocates for nuclear non-proliferation and disarmament. In addition to young people interested or active in international affairs, such as Government or civil society organizations, those with a background in education, academia, journalism, industry and other areas, are encouraged to apply. The programme is open to youth from across the globe, from nuclear-weapon States and non-nuclear-weapon States alike.

Over the course of two years, the selected participants will receive training in general principles of nuclear disarmament, non-proliferation and arms control through online courses, with a selected cohort going on a week-long in-person study tour to Hiroshima and Nagasaki. The future leaders will also exchange ideas with disarmament experts from think-tanks, civil society organizations, media and the diplomatic field, and develop the practical know-how to engage and contribute on issues related to nuclear disarmament, non-proliferation and arms control. Importantly, participants will learn about the lessons that the survivors of the atomic bombings of Hiroshima and Nagasaki, called hibakusha, have long been sharing with the world about the unimaginable suffering that nuclear weapons caused. As the hibakusha continue to

age, it is vital that their powerful stories and appeals to eliminate nuclear weapons are carried forward by the future generation.

The programme will start in 2023 and culminate in 2030 — a year marked by various milestones, including the eighty-fifth anniversary of the atomic bombings of Hiroshima and Nagasaki bombings and the sixtieth anniversary of the entry into force of the Treaty on the Non-Proliferation of the Nuclear Weapons. Upon completion of the programme, alumni will play a key role in training and mentoring the next cohort of interested young nuclear disarmament advocates.

The programme will start in 2023 and culminate in 2030 — a year marked by various milestones, including the eighty-fifth anniversary of the atomic bombings of Hiroshima and Nagasaki bombings and the sixtieth anniversary of the entry into force of the Treaty on the Non-Proliferation of the Nuclear Weapons. Upon completion of the programme, alumni will play a key role in training and mentoring the next cohort of interested young nuclear disarmament advocates.

Following the 2023–2025 inaugural training programme under the Youth Leader Fund, three more rounds of similar trainings will be conducted, generating a positive ripple effect and consolidating a worldwide network of talented future leaders with the shared goal of saving humanity from nuclear weapons. Through education, skills training, mentoring and other support, the hope is that participants will continue their disarmament and peace and security work in their field of interest and expertise after the programme. In recent years, UN Secretary-General Guterres has made a major push to empower youth, recognizing their role as the ultimate force for change and noting that they have proven their power in support of the cause of disarmament.

Last summer, at the tenth Review Conference of the States parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Japan P.M Kishida announced his country's commitment to contribute $10 million towards the United Nations to establish this new disarmament education and mobilization initiative, which seeks to "bring the lessons of Hiroshima and Nagasaki to the world, and the world to Hiroshima and Nagasaki".

Source: https://press.un.org/en/2023/dc3859.doc.htm, 18 May 2023.

Failure to agree on a new nuclear arms control framework to replace New START before it expires in February 2026 would also make it more difficult to bring China, France and the U.K into multilateral arms control, as all three are not ready to consider limits on their nuclear arsenals until the US and Russia bring down their nuclear stockpiles.

GENERAL

Protecting Nuclear Arms Control is a Global Imperative: Group Statement

The world badly needs more nuclear arms control, not less. As security policy leaders from 50 countries in Europe, North America, Asia and the Pacific, we call on the leaders of Russia, the US, China, France, and the UK to ensure that nuclear arms control will not be made yet another victim of geopolitical competition. These five leaders, in January 2022, declared the reduction of strategic risks and the avoidance of war between nuclear-weapon states to be their foremost responsibilities and that a nuclear war can never be won and must never be fought.

In November 2022, G20 leaders (including the US, Russia, China, France, the UK, and India) collectively agreed that the use or threat of use of nuclear weapons is inadmissible. Yet U.S-Russia strategic stability talks are in limbo and the New START treaty, which has played an indispensable role in ensuring reciprocal security, is now in question. As the only existing nuclear arms control agreement between the US and Russia, the world's two largest nuclear-armed countries, the treaty's collapse or expiration without a replacement

would threaten a destabilising arms race.

Failure to agree on a new nuclear arms control framework to replace New START before it expires in February 2026 would also make it more difficult to bring China, France and the U.K into multilateral arms control, as all three are not ready to consider limits on their nuclear arsenals until the US and Russia bring down their nuclear stockpiles. Worsening great power competition has made it even more difficult to advance nuclear arms control and risk reduction more generally – for example, within the framework of the Nuclear Non-Proliferation Treaty. Failure to uphold obligations under that treaty weakens our national and collective security and fails the test of statesmanship. We have many different views on the rights and wrongs of current geopolitical competition. But we all agree that it is long past time to start prioritising nuclear arms control and taking unilateral, bilateral, and multilateral actions.

We call on the P5 nuclear weapons states to take steps to begin strategic stability talks at a variety of levels and to resume strategic risk reduction talks in the P5 format. We call on Russia and the U.S to compartmentalise nuclear arms control by

• Confirming that they will not exceed the New START limits on deployed nuclear

forces, which thus far have not been violated.

• Agreeing to remove the obstacles to full implementation of their New START

obligations and resuming the work of the Bilateral Consultative Commission.

• Committing to pursuing good faith negotiations on a successor framework for New

START before its expiration in 2026.

We call on all signatory and other holdout states of the CTBT to reaffirm their commitments not to test nuclear weapons and also to make concerted efforts towards entry into force of the Treaty.

Source: https://www.apln.network/analysis/statements/group-statement-protecting-nuclear-arms-control-is-a-global-imperative, 17 May 2023.

NUCLEAR SAFETY

JAPAN

Korean Experts Conclude Inspection of Fukushima Plant

The group of Korean experts visiting the ruined Fukushima nuclear power plant…concluded their inspection of the plant and its facilities on May 24. "We saw all the facilities we were scheduled to see"…. "We will need to further analyses on the functions of these facilities." The team was scheduled to meet with Tepco, and officials from the Ministry of Economy, Trade and Industry on May 25 to ask for any follow-up information.

The 21-person team, consisting of experts from the Korea Institute of Nuclear Safety and the Korea Institute of Ocean Science, arrived in Japan earlier on May 21 to begin their visit, a result of an agreement struck between the leaders of both Korea and Japan during their summit meeting in Seoul earlier this month. The team saw on May 23 and May 24 the Advanced Liquid Processing System that handles the treatment of contaminated water at the ruined plant, and the K4 tanks storing the treated radioactive water. "The team inspected a lab in the chemical analysis building that analyzes the concentration of nuclide in the contaminated water," it said in a statement it issued on May 24. "The team also checked the water tanks and, in particular, the capacity of the seawater transfer pump, whose function is directly related to the dilution rate of tritium."

The plant's operator, Tepco, has said that all radioactive materials will be removed from the to-be-released water except tritium, which experts say is not harmful to human health in small amounts. A massive earthquake and tsunami struck Japan on March 11, 2011, destroying the Fukushima Daiichi Nuclear Power Plant. Japan plans to gradually release tons of treated radioactive water from the defunct power plant into the sea — a plan that was announced in 2021 and has been supported by the IAEA but has drawn strong opposition from fishing

communities both in Korea and Japan. Korea, as a member of the IAEA, has been involved with the agency's oversight of Japan's planned release of the treated radioactive water... .

The inspectional visit by Korea to the plant and its facilities was hailed by the members of the President Yoon government as an achievement amid reconciliatory gestures between the leaders of Korea and Japan. It was criticized, on the other hand, by liberal Democratic Party members as another concession the Yoon government was making to Japan without equal returns.... The terminology surrounding the treated radioactive water has also attracted controversy. While the Japanese government officially refers to the water as "treated water," Korean government officials have largely referred to the water as "contaminated water." However, the President Yoon administration will reportedly discuss the official terminology to be adopted by the Korean government going forward upon the return of the expert team from Fukushima.

The terminology surrounding the treated radioactive water has also attracted controversy. While the Japanese government officially refers to the water as "treated water," Korean government officials have largely referred to the water as "contaminated water.

Source: https://koreajoongangdaily.joins.com/2023/05/25/national/diplomacy/korea-japan-fukushima/20230525185440779.html, 25 May 2023.

USA

US Hosts Global Meet to Discuss Nuclear Safety and Advances

The US is hosting a global conference seeking to establish nuclear power programmes that adhere to the highest standards of security, safety and non-proliferation. Countries, including Kenya, are meeting to share experiences in what experts say is a significant leap forward as distinguished scientists, politicians and regulators gather to discuss opportunities and challenges. The Foundational Infrastructure for Responsible Use of Small Modular Reactor Technology (FIRST) talks in DC kicked off...and bear a critical role as a key deliverable from US President Biden's 2021 Leaders' Summit on Climate.

The programme is a multiagency US government initiative designed to provide capacity building support to partner countries in the safe and responsible construction of SMR programmes or other advanced reactors.... The programme is tailored to support countries considering the adoption of SMRs or other advanced reactors to meet their clean energy requirements. These innovative technologies offer numerous benefits, including lower costs, scalability to match grid sizes, flexibility in siting with a small footprint, the ability to integrate with other clean energy sources such as wind and solar power, and a wide range of applications including desalination, industrial processes, district heating, and hydrogen production....

The programme is a multiagency US government initiative designed to provide capacity building support to partner countries in the safe and responsible construction of SMR programmes or other advanced reactors.

The participants' itinerary includes visits to two out of the seventeen national laboratories in the US, namely the Idaho National Laboratory in Idaho and the Sandia National Laboratory in Albuquerque, New Mexico. Additionally, the delegation will have the opportunity to explore the North Anna Nuclear Generating Station in Virginia, further expanding their understanding of advanced reactor technologies and their practical applications....

Source: https://www.standardmedia.co.ke/america/article/2001473597/us-hosts-global-meet-to-discuss-nuclear-safety-and-advances, 24 May 2023.

NUCLEAR SECURITY

RUSSIA

Russia Removes Nuclear Munitions from Belgorod Amid Conflict: Ukraine

Russia has reportedly removed its nuclear munitions from a storage facility in Belgorod

following the seizures of settlements by Russian defectors fighting alongside the Ukrainian army. Members of the Freedom of Russia Legion formed mere weeks into Russian President Putin's "special military operation" he launched on Ukraine in February 2023, is made up of former Russian army members in addition to other Russian and Belarusian volunteers not previously part of military factions. The Russian city of Kozinka was seized in the region—taken by members of the legion and the Russian Volunteer Corps (RDK). Ilya Ponomarev, an exiled Russian politician and political representative for the group...on May 21 that its goal is "to liberate Russia from Putinism."

Members of the Freedom of Russia Legion formed mere weeks into Russian President Putin's "special military operation" he launched on Ukraine in February 2023, is made up of former Russian army members in addition to other Russian and Belarusian volunteers not previously part of military factions.

Andriy Yusov, a spokesman for Ukraine's military intelligence directorate, said during a telethon on May 21 that the Russian facility is known as military unit No. 25624 and located in Grayvoron, a town and administrative center of the Belgorod oblast situated in western Russia near the Ukrainian border, according to Ukrainian news agency Ukrainska Pravda.

Source: https://www.newsweek.com/russia-removes-nuclear-munitions-belgorod-amid-conflict-ukraine-1801940, 22 May 2023.

This brazen act, labeled by the Russian Security Service as "nuclear terrorism," was planned to take place on May 9, a significant day for Russia as it commemorates its victory in World War II, known as the Great Patriotic War. The choice of this symbolic date only served to underscore the gravity of the intended attack.

UKRAINE

Russia Slams Ukraine for 'Nuclear Terrorism' on 2 Nuclear Plants

The Russian FSB announced on May 23 that they successfully foiled a potentially catastrophic terrorist attack orchestrated by Ukrainian intelligence. The FSB accused Kyiv of engaging in what they referred to as "nuclear terrorism." According to an official statement released on the FSB's website, a highly trained sabotage group meticulously planted explosives on more than 30 crucial electric power lines that supplied energy to both the Leningrad and Kalinin nuclear power plants.

Their objective was clear: to disrupt the normal operations of these facilities and, ultimately, inflict severe damage to the nuclear reactors. This brazen act, labeled by the Russian Security Service as "nuclear terrorism," was planned to take place on May 9, a significant day for Russia as it commemorates its victory in World War II, known as the Great Patriotic War. The choice of this symbolic date only served to underscore the gravity of the intended attack.

The FSB revealed that the saboteurs managed to successfully detonate one of the pillars supporting the power lines. Subsequent to the incident, two Ukrainian individuals were apprehended. The suspects were identified as Aleksandr Maystruk, alias "Mechanic," born in 1978, and Eduard Usatenko, alias "Maks," born in 1974. Moreover, a joint operation with international cooperation has placed Yury Kischak, known as "YuBK" and born in 1953, who holds both Russian and Ukrainian citizenship and is currently residing in Belgium, on the wanted list. During the investigation, Maystruk and Usatenko confessed to being recruited by Vitaly Gorbatyuk, an officer of the Ukrainian Foreign Intelligence Service, back in 2022. They underwent extensive training in specialized camps located in the Kyiv and Mykolaiv regions before making their way to the Russia-Belarus border via Poland, successfully breaching it through illegal means.

Additionally, the FSB identified and apprehended two Russian citizens who provided crucial support

to the saboteurs. These accomplices aided in the provision of communication devices and vehicles equipped with counterfeit state registration plates. The explosives utilized in the plot were surreptitiously transported through an international cargo channel, traversing a route that led from the Polish city of Chelm through the Lithuanian city of Shalchininkai.

Finally, they arrived in the Rzhevsky district of Russia's Tver region concealed within a cargo trailer, cleverly equipped with concealed compartments. In response to this alarming incident, a criminal case has been opened, citing charges related to "Sabotage" and "Illegal acquisition, transfer, sale, storage, transportation, transfer or carrying of explosives or explosive devices." If convicted under these charges, the maximum penalty for the former offense is 20 years imprisonment, while the latter carries a maximum sentence of eight years behind bars.

Source: https://www. dailysabah. com/world/europe/russia-slams-ukraine-for-nuclear-terrorism-on-2-nuclear-plants, 26 May 2023.

USA

America's Nuclear Secrets are Vulnerable to Fraudsters and Spies, Watchdog Report Says

A new watchdog report says the federal agency that keeps the nation's nuclear secrets has failed to establish an "insider threat" program to guard against fraudsters, leakers and spies in its midst, a decade after a presidential order to do so. The bluntly-worded report by the Government Accountability Office says the Energy Department has for years failed to act on recommendations from four independent reviewers pointing to gaping holes in its efforts to create an insider threat program. And it notes that it in 2017, the most recent year data was available, there were about 250 unclassified insider threat-related security incidents, including sending classified information over unclassified systems, leaving security areas unattended and not properly protecting classified information. There were also several malicious incidents, the report notes, including a nuclear safety program manager sentenced to 18 months in prison for accepting almost $500,000 in bribes in exchange for official acts.

The GAO report comes after NBC News reported exclusively last year that at least 154 Chinese scientists who worked on government-sponsored research at the Energy Department's Los Alamos National Laboratory over the last two decades have been recruited to do scientific work in China — some of which helped advance military technology that threatens America's national security.

"The theft of nuclear material and the compromise of information could have devastating consequences".... "Threats can come from external adversaries or from 'insiders,' including employees or visitors with trusted access.... Such threats could have significant consequences for national security and could include unauthorized release of classified information; workplace violence; or improper access to sensitive nuclear weapons, material." The GAO report comes after NBC News reported exclusively last year that at least 154 Chinese scientists who worked on government-sponsored research at the Energy Department's Los Alamos National Laboratory over the last two decades have been recruited to do scientific work in China — some of which helped advance military technology that threatens America's national security.

A former Los Alamos scientist pleaded guilty in 2020 to lying about his involvement in a Chinese recruitment program, but most of the conduct described in the report appears to have been legal.

A report by Strider Technologies described what it calls a systemic effort by the Chinese government to place Chinese scientists at Los Alamos, where nuclear weapons were first developed. Many of the scientists were later lured back to China to help make advances in such technologies as deep-earth-penetrating warheads, hypersonic missiles, quiet submarines

and drones, according to the report. It said the scientists were paid as much as $1 million through participation in Beijing's "talent programs," designed to recruit Chinese scientists to return to the Asian country. A former Los Alamos scientist pleaded guilty in 2020 to lying about his involvement in a Chinese recruitment program, but most of the conduct described in the report appears to have been legal.

The kind of technology transfer described in the Strider report is among the risks that insider threat programs are designed to mitigate. In a written response included in the GAO report, the Energy Department said it agreed with all the recommendations and made a series of promises to essentially do better. An Energy Department spokesperson said it has "a highly vetted workforce and maintains programs specifically designed to avoid or minimize insider threats while capitalizing on longstanding protection measures against misuse of critical stockpile assets and resources....We appreciate the GAO's review and have taken a series of actions to further bolster the Department's capabilities to effectively deter, detect, and mitigate insider threats throughout the nuclear enterprise"....

Source: https://www.nbcnews.com/politics/americas-nuclear-secrets-are-vulnerable-fraudsters-spies-watchdog-repo-rcna85987, 24 May 2023.

NUCLEAR WASTE MANAGEMENT

CANADA–USA

Canada and U.S. Team Up to Tackle Nuclear Waste

The organization responsible for managing Canada's nuclear waste and the U.S. Department of Energy have pledged to work together on the long-term storage of spent nuclear fuel. On May 16, the U.S. Department of Energy and Canada's Nuclear Waste Management Organization (NWMO) signed a joint statement of intent in Washington, D.C. A key tenet of the agreement is "robust information-sharing" when it comes to science and technology programs, joint technical studies and best practices on managing used nuclear fuels, including from small modular reactors.

Both countries recently highlighted the prominent role they want nuclear power to fill in terms of addressing climate change and global energy security issues exacerbated by Russia's invasion of Ukraine. While some governments and advocates tout nuclear power as a key solution to the climate crisis, opponents point out it takes a long time to get facilities up and running when deep greenhouse gas emissions reductions are needed by 2030 to limit the devastating impacts of climate change.

Both countries recently highlighted the prominent role they want nuclear power to fill in terms of addressing climate change and global energy security issues exacerbated by Russia's invasion of Ukraine. While some governments and advocates tout nuclear power as a key solution to the climate crisis, opponents point out it takes a long time to get facilities up and running when deep greenhouse gas emissions reductions are needed by 2030 to limit the devastating impacts of climate change. The technology for small modular reactors remains in its early stages, but Alberta, Ontario, New Brunswick and Saskatchewan all intend to deploy SMRs in the coming decades. Beyond timelines and concerns of nuclear weapons proliferation, the big question is how to safely deal with the radioactive waste created by nuclear energy production.

May 23 statement of intent "is a great example of how the international community can come together to support safe and responsible nuclear development and ensure that socially acceptable radioactive waste strategies are developed early".... "I look forward to seeing this collaboration in action." Established in 2022, the NWMO is a Canadian not-for-profit tasked with managing the country's used nuclear fuel. It is in the midst of selecting a site to store Canada's nuclear waste roughly 500 hundred feet underground in what is called a deep geological repository. The NWMO has said it will come to a decision in 2024 after it extended the decision deadline earlier this year to make time for more

consultations with First Nations communities and municipalities. The site selection process began in 2010. There are two possible sites, both in Ontario. The first potential site is in Ignace, 250 kilometres northwest of Thunder Bay, and the second is roughly 180 kilometres northwest of Toronto in South Bruce.

Established in 2022, the NWMO is a Canadian not-for-profit tasked with managing the country's used nuclear fuel. It is in the midst of selecting a site to store Canada's nuclear waste roughly 500 hundred feet underground in what is called a deep geological repository. The NWMO has said it will come to a decision in 2024 after it extended the decision deadline earlier this year to make time for more consultations with First Nations communities and municipalities.

According to the NWMO, the storage project will only proceed in an area with informed and "willing hosts," where the municipality, First Nation and Métis communities, and others in the area are working together to implement it. The U.S. currently has one deep geological repository near Carlsbad, N.M., that permanently houses nuclear waste created by the nation's nuclear defence program 2,150 feet underground in salt formations.

Specifically, it permanently stores clothing, protective equipment, tools, debris, soil and other items contaminated with small amounts of plutonium and other human-made radioactive elements, according to the Department of Energy's webpage for the pilot program. This type of product at the U.S.'s aforementioned Waste Isolation Pilot Project falls into the category of low-level nuclear waste. Intermediate-level waste is typically used reactor core components, resins and filters used to purify reactor water systems, according to the NWMO, while high-level waste is the used nuclear fuel itself, which is highly radioactive, long-lived and requires careful, long-term management. The latter is what Canada's deep geological repository will house.

For the time being, all nuclear waste is stored on-site at Canada's four major nuclear power plants, three of which are in Ontario. Nuclear power is a key part of the province's energy mix. In 2019, nearly 60 per cent of Ontario's electricity was produced by nuclear power, according to Canada's energy regulator. The statement of intent signed on May 23 does not come as a surprise. In March, Natural Resources Canada and the Department of Energy released a joint statement on the two countries' intent to collaborate....The NWMO has a similar co-operation and information-sharing agreement with Andra, its French counterpart.

Source: https://fftimes.com/news/district-news/canada-and-u-s-team-up-to-tackle-nuclear-waste/, 23 May 2023.

GENERAL

Nuclear Waste Management Market Size is Projected to Reach USD 7.4 billion, with a CAGR of 2.80% by 2030

According to a Comprehensive Research Report by Market Research Future (MRFR), "Nuclear Waste Management Market Information by Waste Type, Reactor Type, Application, and Region - Forecast till 2030", Nuclear Waste Management Market could thrive at a rate of 2.80% between 2022 and 2030. The market size will be reaching around USD 7.4 Billion by the end of the year 2030.... The nuclear waste management market involves the safe and efficient handling, transportation, and storage of nuclear waste generated by nuclear power plants, research facilities, medical institutions, and other sources.

The nuclear waste management market involves the safe and efficient handling, transportation, and storage of nuclear waste generated by nuclear power plants, research facilities, medical institutions, and other sources. Nuclear energy is becoming increasingly important as countries seek to reduce their dependence on fossil fuels and decrease their carbon emissions.

Nuclear energy is becoming increasingly important as countries seek to reduce their dependence on fossil fuels and decrease their carbon emissions. This has led to an increase in the number of nuclear power plants around the world, which in turn has created a significant amount of nuclear waste. As a result, there is a growing need for safe and effective nuclear waste management solutions....

Source: https://www.globenewswire.com/news-release/2023/05/19/2672356/0/en/Nuclear-Waste-Management-Market-Size-...-MRFR.html,19 May 2023.

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).

Centre for Air Power Studies
P-284
Arjan Path, Subroto Park,
New Delhi - 110010
ZTel.: +91 - 11 - 25699131/32
Fax: +91 - 11 - 25682533
Email: capsnetdroff@gmail.com
Website: www.capsindia.org

Edited by: Director General, CAPS

Editorial Team: Dr Sitakanta Mishra, Anubhav Shankar Goswami, Dr. Ngangom Dhruba Tara Singh, Rishika Singh, Jay Desai

Composed by: CAPS