



OPINION – World Nuclear Transport Institute

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Why Safe Nuclear Transport is Key to Net Zero

The ongoing climate crisis is one of the most pressing issues we face today. With the negative impact of carbon emissions from fossil fuels becoming increasingly evident, there is an urgent need to shift towards renewable and sustainable energies. However, while sources such as wind, solar and hydropower are excellent alternatives, they cannot combat the climate crisis alone.

In order to reach the ambitious net zero targets the UK has set, we believe that we must embrace nuclear power. The world's energy needs are growing at an unprecedented rate and we cannot solely rely on renewables and battery storage to provide sufficient energy. Sustainable and renewable energy sources must be integrated with other options such as nuclear to achieve the levels of energy output that we require.

Apart from powering homes, offices and hospitals, we also need vast amounts of energy to drive our industries such as steel, cement, paper and transport. It is critical to have an energy source that can provide us with the required power to keep up with these increasing demands without negatively impacting the environment.

To fully harness nuclear potential, it is essential that we prioritise safety and security in the use and transportation of nuclear and radioactive materials. This requires robust policies and regulations, overseen by organisations such as the IAEA, to ensure the highest standards are upheld. By prioritising safety and security, we can build public trust in nuclear power and pave the way for a sustainable future.

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To fully harness nuclear potential, it is essential that we prioritise safety and security in the use and transportation of nuclear and radioactive materials. This requires robust policies and regulations, overseen by organisations such as the IAEA, to ensure the highest standards are upheld. By prioritising safety and security, we can build public trust in nuclear power and pave the way for a sustainable future.

Additionally, robust safety measures play a crucial role in preventing accidents and incidents that could have far-reaching consequences. By

promoting safe and secure transport of nuclear materials, we can move towards a greener future, reducing our carbon footprint while meeting growing energy demand.

Nuclear energy can provide a secure, reliable, low-carbon alternative to fossil fuels, as part of the mix with renewable energy sources. The development of large-scale reactors, advancements in SMRs and other new nuclear technologies requiring different fuels and transport packages creates an essential role for the World Nuclear Transport Institute (WNTI) to influence the evolution of regulation. We can help to ensure the highest standards are met when it comes to the transportation of nuclear and radioactive materials.

For over 25 years, WNTI has collaborated with technical experts from its global membership, policymakers, regulatory bodies and industry stakeholders to drive the development of standards and best practices for the industry. Their expertise and dedication are crucial in ensuring that nuclear materials are transported safely and securely, allowing us to harness the benefits of nuclear energy while minimising the risks.

WNTI drives high standards in the nuclear transport industry, with working groups covering numerous areas, including front-end transport, emergency preparedness and nuclear propulsion. WNTI recently established New Nuclear Working Group chaired by Ben Whittard, Managing Director, Solutions, of Nuclear Transport Solutions (NTS) has been created to support WNTI members and set global standards to enable the successful roll-out of small modular and advanced nuclear technologies, contributing to the efforts to move

away from fossil fuels and improving energy security. The group will do this by engaging with industry partners, exploring the important role

transport will play, and seek to proactively identify and solve issues and challenges. The working group will also act as a vehicle to offer a single voice to important stakeholders such as the IAEA and regulators worldwide.

Policymakers and regulators have a critical role to play in achieving our

green energy goals. As we strive towards net zero emissions, it is essential that they prioritise the development of policies and regulations that support the safe and secure use of nuclear energy and new nuclear technologies. By establishing robust guidelines and enforcing strict safety measures, policymakers can build public trust in

nuclear power. Regulators, on the other hand, must ensure that these policies are adhered to and that the highest standards are maintained throughout the industry. Through their collective efforts, policymakers and regulators can create an environment that enables

the safe and efficient transportation of nuclear materials, helping us to achieve our net zero goals while safeguarding the well-being of people and the environment.

The IAEA has said that at a time when the use of variable renewables is growing, nuclear power makes a key contribution to energy supply security and grid stability. Through its dedication and expertise, WNTI ensures that these materials are safely and securely transported, allowing us to harness the benefits of nuclear energy while protecting our planet. Policymakers and regulators must continue to prioritise safety and enforce strict

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guidelines to build public nuclear has a role to play in the UK's future secure energy mix trust and ensure a safe and efficient nuclear industry.

The WNTI is a dedicated membership and non-governmental organisation at the forefront of the global nuclear transport industry. We are here to support, advocate, and drive progress in this critical field. We pride ourselves on fostering diversity and inclusivity and recognising that industry collaboration is the foundation of progress. Our network proudly represents 40+ influential companies, offering a dedicated platform and the essential resources to drive meaningful change.

Source: <https://www.newstatesman.com/special-report/sustainability/energy/2023/11/uk-nuclear-strategy-trashed-4>, 17 November 2023.

OPINION – Lawrence J. Korb, Stephen Cimbala

Nuclear Strategy “Through a Glass Darkly”

The Congressional Commission on the Strategic Posture of the United States issued its final report in October 2023. Because of the ongoing wars in the Middle East and Ukraine, it did not receive the attention it should have given the critical role of nuclear weapons in our security. The report contends that, although the fundamentals of the U.S. deterrence strategy remain sound, the application of that strategy must change significantly to address the 2027-2035 threat environment.

According to the report, the U.S.-led

U.S.-led international order and the values it upholds “are at risk from the Chinese and Russian authoritarian regimes,” and the risk of military conflict with those major powers has grown and “carries the potential for nuclear war.” Today the United States is on the cusp of having not one, but two nuclear peer adversaries, each with ambitions to change the international status quo, by force if necessary, a situation which the United States did not anticipate and for which it is not prepared.

necessary, a situation which the United States did not anticipate and for which it is not prepared. While the risk of a major nuclear conflict remains low, the risk of a military conflict with either or both Russia and China, while not inevitable, has grown, and with it the risk of nuclear use, possibly against the U.S. homeland.

To meet this and other foreseeable national security challenges, the Commission recommends an ambitious program of nuclear and conventional force modernization, a more resilient space architecture with offensive and

Included in the Commission's recommendations is the completion of existing plans for the modernization of the U.S. strategic nuclear triad of intercontinental land-based, sea-based, and airborne nuclear delivery systems and warheads. This program more or less tracks the consensus of the Obama, Trump, and Biden administrations.

international order and the values it upholds “are at risk from the Chinese and Russian authoritarian regimes,” and the risk of military conflict with those major powers has grown and “carries the potential for nuclear war.” As the Commission argues: Today the United States is on the cusp of having not one, but two nuclear peer adversaries, each with ambitions to change the international status quo, by force if

defensive elements, an expansion of the U.S. defense industrial base, improved nuclear infrastructure, and, where appropriate, nuclear arms control and-or measures of nuclear risk reduction.

In addition, it argues that the United States should ensure that it is on the cutting edge of emerging technologies related to security and defense, including big data analytics, quantum computing, and artificial intelligence. Included in the Commission's recommendations is the completion of existing plans for the modernization of the U.S. strategic nuclear triad

of intercontinental land-based, sea-based, and airborne nuclear delivery systems and warheads. This program more or less tracks the consensus of the Obama, Trump, and Biden administrations, although the Commission recommends possible increases in the hitherto projected numbers of sea-based and airborne nuclear launch systems. According to the Commission, U.S. nuclear strategy should be based on six fundamental

tenets: (1) assured second strike; (2) flexible response to achieve national objectives; (3) tailored deterrence; (4) extended deterrence and assurance; (5) calculated ambiguity in declaratory policy; and (6) hedge against risk.

It contends that flexible response should provide a credible range of resilient response options to restore nuclear deterrence and promote conflict termination by “convincing an adversary’s leadership it has seriously miscalculated, that further use of nuclear weapons will not achieve its objectives, and that it will incur costs that far exceed any benefits it can achieve should it escalate further.”

Although the Commission includes both conventional and limited nuclear options in its recommended tool kit for deterrence and assurance, it is clear that it views current U.S. non-strategic weapons as insufficient for probable future deterrence stress tests. In this view, it is not alone. The Nuclear Posture Reviews (NPRs) of the Obama, Trump, and Biden administrations largely agreed about the size and composition of U.S. strategic nuclear forces. On the other hand, their perspectives on lower-yield or non-strategic nuclear weapons differed.

The Obama administration deemphasized non-strategic nuclear weapons, but the Trump administration proposed two new weapons to offset perceived deficiencies in U.S. flexible nuclear response: a low-yield version of the W76 warhead for the Navy’s Trident D-5 SLBM; and a new nuclear-capable SLCM-N. The Biden administration chose to retain the low-yield D-5, but its 2022 NPR excluded any plans to develop the SLCM-N.

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In accessing the Commission’s recommendations, it is important to keep in mind the perspectives of several experts and other factors. Keith B. Payne and David J. Trachtenberg, both former high-ranking defense department officials, have noted that Russia and China continue to build additional non-strategic nuclear weapons (NSNW) and that

Russia’s stockpile of deployed NSNW maybe ten times or more the number of a similar American weapon.

The result of disparities in NSNW between the U.S. and Russia or China could be gaps in the spectrum of deterrence and assurance. According to

Payne and Trachtenberg, in the near-absence of proportional, regional U.S. nuclear capabilities, deterrence could fail because Russia and China understandably question whether the United States would be willing to turn a regional conflict into a potentially suicidal nuclear war, and thus calculate that they are in greater freedom to engage in regional, limited nuclear threats or employment.

Mark B. Schneider, a senior career Pentagon and State Department official, also points to

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potential deterrence vulnerabilities in the larger Russian numbers of non-strategic nuclear weapons compared to those available to U.S. forces: There are very large numbers of potential targets for low yield/low collateral damage battlefield nuclear weapons. If the United States seeks to keep a conflict limited by refraining from strategic weapons use, it will clearly be at a significant disadvantage in non-strategic nuclear force numbers. Indeed, the more the United States seeks to keep the nuclear conflict limited by creating a firebreak between non-strategic and strategic nuclear weapons, the more significant the Russian nuclear advantage will become.

As far back as 2019, Lt. Gen. Robert P. Ashley, then head of the U.S. Defense Intelligence Agency (DIA,) noted that Russia possesses about 2,000 non-strategic nuclear warheads and added that its stockpile was likely to grow over the next decade: Russia is adding new military capabilities to its existing stockpile of nonstrategic nuclear weapons, including those employable by ships, aircraft and ground forces. These nuclear warheads include theater- and tactical-range systems that Russia relies on to deter and defeat NATO or China in a conflict. Russia's stockpile of non-strategic nuclear weapons (is) already large and diverse and is being modernized with an eye towards greater accuracy, longer ranges, and lower yields to suit their potential warfighting role.

General Ashley also noted, however, that due to Russia's lack of transparency and the dual nature of delivery systems—incorporating conventional or nuclear weapons—estimates of Russia's actual numbers of NSNW stockpiled or deployed are imperfect. As a 2020 report by the U.S. Congressional Research Service, which was updated in April 2022, it is unclear why Russia

retains and may expand its stockpile of NSNW.

Some contend that a larger and more diverse inventory of NSNW is Russia's compensation for conventional forces that are inferior to those of the U.S. and NATO. Others see Russia's NSNW modernization as contributing to an "escalate to de-escalate" nuclear doctrine that would require a wider spectrum of NSNW for coercive bargaining and war termination on terms favorable to Russia.

In order to deter nuclear coercion and theater attacks, they plan to strengthen regional deterrence with capabilities such as the F-35A dual-capable fighter aircraft (DCA) equipped with the B-61-12 bomb; the W-76-2 warhead (low yield submarine launched ballistic missile warhead); and the Long-Range Standoff (LRSO) weapon.

The Biden administration's recently released NPR also addresses the significance of non-strategic nuclear capabilities in U.S. and allied defense planning. In order to deter nuclear coercion and theater attacks, they plan to strengthen regional deterrence with capabilities such as the F-35A dual-capable fighter

aircraft (DCA) equipped with the B-61-12 bomb; the W-76-2 warhead (low yield submarine launched ballistic missile warhead); and the Long-Range Standoff (LRSO) weapon.

According to the NPR: These flexible, tailorable capabilities are key to ensuring that Russia's leadership does not miscalculate regarding the consequences of nuclear use on any scale, thereby reducing their confidence in both initiating conventional war against NATO and considering the employment of NSNW in such a conflict. Despite this apparent consensus about the need to bolster U.S. and allied deterrence with additional NSNW, the place of NSNW in Russian strategy is more complex than the actual number of weapons available.

As scholar and military theorist Dmitri Adamsky points out, in terms of Russia's ongoing war against Ukraine, its nuclear rhetoric is part of a "cross-domain coercion cocktail" intended as a means of strategic persuasion short of nuclear first use. Nuclear first use, if it occurs, is likely to have been preceded by muscle-

flexing in the form of various “strategic gestures” (coercive signaling for deterrence and compellence) with nuclear forces to communicate the capability and resolve to climb the ladder of escalation.

As Dmitri explains: These “gestures” will be decisive enough to communicate credibility, but slow enough to allow the West to take notice of them, digest the information, and adjust accordingly. The Kremlin is unlikely to skip up the escalation stairs, but will advance through this phase incrementally to generate maximum effectiveness.

On the other hand, some experts rightfully caution that not every capability gap necessarily leads to a gap in deterrence or assurance. RAND Corporation analyst Edward Geist suggests that the resolve of U.S. decisionmakers prior to or during a crisis may be more important for deterring adversaries than the numbers and kinds of weapons available.

According to Geist: Not every deterrence or assurance gap can be remedied by acquiring more or better nuclear weapons. If adversary leaders scoff at the resolve of U.S. decisionmakers, even huge U.S. advantages in the number and quality of the United States’ nuclear weapons might not deter these leaders. Exaggerated rhetoric about ostensible adversary nuclear advantages could greatly enhance the danger of this outcome.

In addition to the opinions of these experts, it should also be noted that the U.S. Enduring Stockpile includes warheads of variable yield for ALCMs, SLCMs, and SLBMs with options as low as five kilotons. For “messaging” purposes, the yield of the weapon may be less important than the choice of target to attack. For example, the demonstrative use of a nuclear weapon to create an EMP that fries electronic circuits over

a wide area might be impressive without causing an immediate loss of life or mass destruction of property. Using a low-yield NSNW at sea might threaten naval vessels and their crews without collateral damage to civilians or facilities ashore.

Nuclear messaging could even occur without actually firing a weapon. Weapons might be moved from their peacetime storage sites to locations nearer to their assigned launchers and in ways that were obviously visible to enemy intelligence. Bombers and other aircraft that are nuclear capable can be placed on higher alert, relocated, or sent aloft on trajectories that indicate growing seriousness about ongoing events.

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Military “exercises” can involve more nonroutine activities and visible preparations for attack. Paradoxically, signals of resolve for

either conventional or nuclear deterrence can also be sent by showing apparent stoicism and self-control in the face of adversary efforts to upset the applecart. Threats of nuclear escalation by provocateurs can be met by treating them as bombastic overkill and by reassuring all audiences that the United States has contingency plans already in place for almost every situation and that it will continue to conduct real-time rehearsals with allies and partners for future challenges.

The U.S. president and national security apparatus should, as JFK once recommended, “never negotiate out of fear, but never fear to negotiate.” The precise numbers and kinds of weapons that the United States will need to offset the rise of China as a nuclear peer competitor and modernization of Russia’s nuclear arsenal are not estimated in the commission report.

But the apparent costs for modernization of

nuclear forces and infrastructure, including nuclear command, control and communications (NC3), delivery systems, warheads, cyber and space supports, and improved U.S. missile and air defenses, plus advanced hypersonic offensive weapons and other means of offsetting enemy integrated air and missile defenses (IAMD), should involve considerable sticker shock.

More importantly, the question of U.S. strategy and understanding of Russian and Chinese military strategy (and vice versa), including that for nuclear deterrence or use, looms largely in the background. Imagine a four-dimensional chess game of perceptions management taking into account the following: U.S. Perceptions of Russian and Chinese Strategy, Russian and Chinese Perceptions of U.S. Strategy, Russian and Chinese Perceptions of U.S. Strategy, and U.S. Perceptions of Russian and Chinese Strategy. Each of these four dimensions interacts with all the others, exerting some influence and receiving feedback. In addition, it will be important to know how closely Russian and Chinese military-strategic planning is coordinated with respect to nuclear deterrence, first use or first strike. Presidents Xi and Putin have made demonstrations of political affinity, and the two states regularly conduct shared military exercises.

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China's position on transparency may evolve as its strategic nuclear force deployments increase in number and move into the same neighborhood as those of the United States and Russia. Even then, arms control will be a qualitative as well as a quantitative challenge, assuming a tripartite participation by the three great powers. China and Russia will depend more on land-based missiles than the United States, with the lion's share of its weapons deployed on submarines and bombers.

However, this does not necessarily mean that Beijing and Moscow are totally transparent with respect to their nuclear force holdings or their actual war plans. Chinese and Russian leadership share hostility to what they regard as American global hegemony, but the relationship between that and future force planning remains uncertain. Arms control could offer a forum for increasing consultation between China and Russia, in addition to their expectations about the United States.

Even if, for example, China builds its strategic nuclear forces to a maximum of 1,500 operationally deployed warheads on 700 or fewer intercontinental launchers, the PLA would still remain within the New START limits for deployed weapons and launchers currently accepted by the United States and Russia (although Russia has temporarily withdrawn from participation in New START formal negotiations, it has indicated its willingness to remain within New START limits unless or until otherwise indicated). Some understandable skepticism exists about whether China would agree to take part in strategic arms control talks as they have been conducted in the past by the United States and Russia. China would have to accept a degree of transparency not previously permitted with respect to its deployed (and perhaps non-deployed) nuclear weapons and launchers.

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More nuclear weapons do not necessarily mean greater security, and a trade-off between next-generation conventional and nuclear weapons is almost inevitable unless defense budgets are completely open-ended. U.S. defense planners, including those dealing with decisions about nuclear weapons, will need games and studies that maximize uncertainty, include scenarios with nonlinear events, and force different strategic mindsets into close-quarter combat.

Although both Russia and China are improving their deployed SSBN and bomber forces, the United States will remain at the forefront of ballistic missile submarine and strategic bomber-related technologies for the foreseeable future. Additional difficulties in seeing "through a glass darkly" are presented in attempts to forecast how the dominant technologies of the future, including AI, quantum computing, nanotechnology, autonomous weapons systems, directed energy weapons, and hypersonics, among others, will influence decisions about nuclear force planning and "how much is enough" for deterrence.

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The role that nuclear power should play in creating a more sustainable future has long provoked strong feelings — among advocates and critics alike. It's set to be a hot topic at the COP28 summit in Dubai, which begins this week. There are reports that there will be a concerted effort to get behind a big increase in nuclear capacity from now to 2050.

into close-quarter combat. Keeping all these factors in mind will ensure that we do not overreact to the Commission's recommendations and that they are implemented in a manner that bolsters our national security.

Source: <https://nationalinterest.org/feature/nuclear-strategy-%E2%80%9Cthrough-glass-darkly%E2%80%9D-207306>, 16 November 2023.

OPINION – Anmar Frangoul

Nuclear's Uncertain Role in the Shift Away from Fossil Fuels is Seen as Critical and Very Contentious

The role that nuclear power should play in creating a more sustainable future has long provoked strong feelings — among advocates and critics alike. It's set to be a hot topic at the COP28 summit in Dubai, which begins this week. There are reports that there will be a concerted effort to get behind a big increase in nuclear capacity from now to 2050. Of particular interest to observers will be a ministerial event called "Atoms4NetZero" on Dec. 5. Co-hosted by the IAEA and the COP28 presidency, the event will "announce the IAEA Statement on Nuclear Power," according to the COP28 website.

That, it adds, reflects the "critical role of nuclear in the net zero transition." Atoms4NetZero was namechecked by the World Nuclear Association in September when it announced the launch of an initiative called "Net Zero Nuclear," which aims to triple the planet's nuclear capacity by the middle of the century. In a statement issued alongside that announcement, Rafael Mariano Grossi, the IAEA's director general, stressed the importance of the

coming climate summit. "Building on the efforts made during COP 26 and COP 27, nuclear energy will feature even more prominently at COP28," he said. "As more nations understand the role nuclear can play in achieving energy security and decarbonisation targets, global support for nuclear energy is growing," he added. The IAEA, for its part, will also have its own "Atoms4Climate" pavilion at COP28, where it says it will "showcase how nuclear technology and science are addressing the twin challenge of climate change mitigation and adaptation."

A Major Debate: In a sign of how polarizing the debate around the subject can be, this month, the leader of Germany's center-right Christian Democratic Union lamented his country's move away from nuclear power after the closure of its last three plants in April 2023. "The German government took a

decision which was in our view absolutely wrong, a strategic mistake to get out of nuclear," Friedrich Merz told CNBC's Annette Weisbach. Merz — whose party is not in the coalition government led by Chancellor Olaf Scholz — said rather than focusing only on wind and solar, "all energy sources" need to be utilized. "The energy supply — for this country, for our industry — is decisive for our competitiveness," he went on to state.

High-profile figures in the German government do not share Merz's viewpoint. "The phase-out of nuclear power makes our country safer; ultimately, the risks of nuclear power are uncontrollable," Steffi Lemke, Germany's federal minister for the environment and nuclear safety, said in April. "We now face decades full of challenges before we can safely and responsibly dispose of our nuclear legacy," she later added. "But switching off the final three nuclear power plants will usher in a new era in energy production."

This kind of analysis — that nuclear is not the

answer — is shared by environmental organizations like Greenpeace. "Nuclear power is touted as a solution to our energy problems, but in reality it's complex and hugely expensive to build," its website says. "It also creates huge amounts of hazardous waste." "Renewable energy is cheaper and can be installed quickly," it added. "Together with battery storage, it can generate the power we need and slash our emissions."

While Germany — Europe's largest economy — has moved away from nuclear, other countries are looking to expand their capacity. They include the U.K., which says it wants to deliver as many as 24 gigawatts by 2050, and Sweden, which is looking to construct new reactors. France, a major player in nuclear power, is also planning to increase its number of reactors. Energy markets are still affected by the shocks from Russia's full-scale invasion of Ukraine in February 2022, and discussions about nuclear power are not going away anytime soon.

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full-scale invasion of Ukraine in February 2022, and discussions about nuclear power are not going away anytime soon. ... "Nuclear energy, with around 413 GW of capacity operating in 32 countries, contributes to both goals by avoiding 1.5 Gt of global emissions and 180 bcm of global gas demand a year."

Source: <https://www.cnbc.com/2023/11/27/the-debate-over-nuclears-role-in-the-energy-transition-continues.html>, 27 November 2023.

OPINION – Chermaine Lee

Can China Achieve its Nuclear Energy Ambitions?

Organizers of the coming COP28 climate conference, believing nuclear energy must play a role in weaning the world off fossil fuels, are likely to be comfortable with Chinese plans to make nuclear power a major part of its energy future. While high-profile accidents at Three Mile Island, Chernobyl and Fukushima have tarnished the

image of nuclear power in much of the world, China — the world's biggest carbon emitter — is pressing ahead with ambitious plans for new nuclear construction.

Beijing has approved at least 21 new power units since 2021, and each year, six to eight new nuclear units are expected to be greenlit, according to a September report in Xinhua, the state-controlled news agency. The country, which already generates more power through nuclear energy than any country except the United States, aims to meet 10% of its national power needs with nuclear by 2035 and 18% by 2060, the report said.

That effort can be expected to sit well with Sultan Al Jaber, president of the United Nations Climate Change Conference, or COP 28, which opens Nov. 30 in Dubai. Jaber told Agence France-Presse earlier this year that he supports expanding nuclear power, calling it a "robust bridge" in energy transition. However, China has a long way to go and several obstacles to surmount if it is to reach its goal. Nuclear currently accounts for only 2.2% of its installed electricity generation capacity and ranks last behind other green energy sources including thermal, hydro, wind and solar.

Safety concerns after Japan's devastating Fukushima incident in 2011 have hampered the growth of nuclear energy in China, according to Philip Andrews-Speed, senior research fellow at the Oxford Institute of Energy Studies. "What happened after Fukushima was [China] suspended the construction of all new [nuclear] plants. They also sustained this policy that no inland nuclear power plants [can be built]," Andrews-Speed told VOA in a video call.

The plants that will be built are expected to dot the coastline as it takes a lot of fresh water for them to operate, and it's considered less risky to

discharge highly radioactive wastewater into water bodies nearby. Compared to other clean energy plants such as solar and wind plants, nuclear plants take longer to build and put into operation because of their complex nature and safety concerns, the nuclear expert added. China currently has a shortage of skilled workers in this field.

Thus far, there are about 55 nuclear power plants in China, and more than 20 under construction. Achieving 10% of the energy mix in 2035 could be difficult, according to Bing Lam Luk, laboratory manager at the City University of Hong Kong and the chairperson of the Hong Kong Nuclear Society. "It takes on average about 10 years or more to build one plant, so unless authorities speed up greenlighting new plants, reaching 10% can be hard. ... Another issue is that it's increasingly difficult to find a new site along the coast to build it," Luk said in an audio call.

Although there has never been a serious nuclear accident in China, some communities are resistant to having a plant nearby. A plan to build a nuclear fuel center in Guangdong was aborted in 2013 because of public opposition, Luk pointed out. He said more public education will be

needed to change that perception. At the same time, safety is becoming less of a concern because of the emergence of fourth-generation and small modular reactors with which, Luk said, a large-scale accident would be "nearly impossible." He said this could make it possible for China to change its policy and start building more nuclear plants inland.

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Small modular reactors are more energy efficient than their larger counterparts and easier to transport and install, Luk said. He said the fourth-generation technology now being tested by Tsinghua University in Beijing replaces water coolant with helium, which is more heat resistant, reducing the risk of an explosion. But a study from Stanford and University of British Columbia found that these reactors, touted as the future of nuclear energy, can produce more radioactive waste than conventional ones.

China's development of fourth-generation reactors is expected to benefit from the long-established sharing of technical information among countries including China, the United States, France, Japan, South Korea and Britain. The cooperation between China and France, for instance, started a few decades ago. China's first two nuclear plants were built near Hong Kong in the mid-1980s with imported technology and managed by state-owned energy firm Electricite de France.

International Cooperation:

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Geopolitical tensions between China and the West can also be a hurdle. Britain last year removed a Chinese company from its Sizewell nuclear project amid souring U.K.-China relations. Recently, the U.S. also clamped down on its nuclear trade with China after decades of cooperation owing to "national security interests" and "common defense." China has, however, started exporting its nuclear technology to other countries such as Pakistan.

China's first two nuclear plants were built near Hong Kong in the mid-1980s with imported technology and managed by state-owned energy firm Electricite de France.

Many joint ventures in China followed and the two countries published a joint statement in April this year on "developing pragmatic cooperation in the field of civilian nuclear energy." They pledged to cooperate on the reprocessing of nuclear waste. France is ahead of China in the reprocessing of spent fuel, so the two can work on this together, said Andrews-Speed. France is building a center where radioactive waste can be disposed of 500 meters below ground, set to open in 2035. China will only begin constructing a waste site by the

2040s at the earliest.

Geopolitical tensions between China and the West can also be a hurdle. Britain last year removed a Chinese company from its Sizewell nuclear project amid souring U.K.-China relations. Recently, the U.S. also clamped down on its nuclear trade with China after decades of cooperation owing to "national security interests" and "common defense." China has, however, started exporting its nuclear technology to other countries such as Pakistan. Asked about nuclear energy's role at COP28 this year, Luk said nuclear is likely to remain one of the main directions for energy transition discussions. "Energy storage remains an issue for renewable energy ... so nuclear path will likely keep growing steadily," he said.

Source: <https://www.voanews.com/a/can-china-achieve-its-nuclear-energy-ambitions-/7368281.html>, 24 November 2023.

NUCLEAR STRATEGY

RUSSIA

Russia has 'Principled Stance' on Nuclear Weapons – Foreign Ministry

Russia will not break its moratorium on nuclear tests unless the US does so first, Russian Foreign Ministry spokeswoman Maria Zakharova has told RT, reiterating Moscow's pledge on the issue. Earlier this month, Russia revoked its ratification of the 1996 CTBT, which prohibits all live nuclear explosions. Moscow remains a signatory to the treaty and has vowed to observe the terms of the

agreement, even though its commitment is no longer formally valid. Zakharova stated that Russia has a "principled stance on nuclear weapons and their use," as formulated in official doctrine and reiterated on many occasions by President Vladimir Putin.

Russia downgraded its participation in the CTBT to match that of the US. The treaty has yet to come into force internationally because it requires ratification by nations with access to certain nuclear technologies. In late October, after Moscow announced its intention, the US conducted an experiment at the Nevada National Security Site (NNSS), a nuclear test facility.

The test involved a chemical explosion and did not violate the terms of the treaty, Zakharova noted. She added that Moscow was monitoring American actions regarding nuclear tests. Nuclear weapons came up in Zakharova's interview with RT in the context of the Israeli military operation in Gaza. Israeli Heritage Minister Amichai Eliyahu recently suggested that his nation could deploy nuclear weapons in the Palestinian enclave. West Jerusalem neither confirms nor denies that it has a nuclear arsenal, which the SIPRI estimates to include 80 devices.

Zakharova said Moscow considered the nuclear threat unacceptable and appreciated the speed with which Israeli Prime Minister Benjamin Netanyahu had disavowed his minister's statements. The atomic bombing of Hiroshima and Nagasaki by the US during World War II would hopefully remain the last nuclear strikes in history, Zakharova added.

Source: <https://www.daily-sun.com/post/723681>, 29 November 2023.

Russia Informs Japan of Intention to Terminate Deal on Cooperation on Nuclear Arms Reduction

Russia announced that it notified Japan of its intention to terminate an agreement on cooperation to reduce nuclear weapons. The Russian Foreign Ministry said Moscow informed

Japan of its intention to terminate the deal on Nov. 21. It said the decision was made in the context of the "openly anti-Russian policy" of Japanese Prime Minister Kumio Fushida's administration, as well as sanctions implemented and other measures such as Tokyo's military buildup near the border in the Russian Far East. "We consider it impossible to continue interaction with an unfriendly state on issues affecting, among other things, interests of our national security," it said

in a statement, adding that the deal will terminate May 21. Russian Prime Minister Mikhail Mishustin signed an order Nov. 7 to suspend the deal signed in 1993, which sought to establish cooperation on the reduction of Moscow's nuclear weapons and solving environmental

issues between both countries.

Source: <https://www.aa.com.tr/en/asia-pacific/russia-informs-japan-of-intention-to-terminate-deal-on-cooperation-on-nuclear-arms-reduction/3067270>, 29 November 2023.

USA

Disarmament Grows More Distant as US Plans Another "Upgrade" to Nuclear Bomb

In October, the United States Department of Defense announced plans to develop a new version of the B61-13 nuclear gravity bomb... According to a Department of Defense press release, the B61-13 reflects a "changing security environment and growing threats from potential adversaries." Development of the bomb would not increase the overall number of weapons in the U.S. stockpile, the release said...

A Political Bomb: Matt Korda, a senior research fellow with the Federation of American Scientists' Nuclear Information Project, told Truthout that the decision to develop the B61-13 appears to have been motivated more by politics than perceived military need. Korda and fellow nuclear weapons analyst Hans Kristensen published a detailed summary report explaining the technological characteristics, political dynamics and background behind the B61-13. They suggest development of the B61-13 is a tradeoff to placate Republicans

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in Congress like Rep. Doug Lamborn of Colorado, Sen. John Kennedy of Louisiana, and others who have argued for the retention of the B83, the last megaton-class weapon in the U.S. nuclear arsenal.... "They could very easily say, 'alright, great. Thanks for the B61-13. And we're going to keep the B83,'" said Korda. However, the high cost of more additions without any cuts could erode support for both weapons systems. Korda says it's unclear what new capability the B61-13 offers that doesn't already exist. "It's hard for me to imagine a specific target or mission that the U.S. military would not be able to complete if they didn't have this bomb." Korda said.

Old Bomb, New Bomb: If built, the B61-13 would have a maximum yield of 360 kilotons, far larger than the B61-12, which has a maximum yield of 50 kilotons. By comparison, the bombs that destroyed Hiroshima and Nagasaki had yields of 15 and 21 kilotons respectively. Korda notes the importance of not oversimplifying comparisons in bombs because the "destructive power" of a nuclear weapon doesn't scale perfectly with yield....

In a joint statement regarding the B61-13, House and Senate Armed Services Committee ranking members Rep. Mike Rogers (R-Alabama) and Sen. Roger Wicker (R-Mississippi) said they welcomed a variant of the B61 in order to "reach hardened and deeply-buried targets" but called it "only a modest step in the right direction."

Referring to an October 2023 final report of the Congressional Commission on the Strategic Posture of the United States, Rogers and Wicker said, "China and Russia are in a full-on arms race, and the U.S. is running in place. Dramatic transformation of our deterrent posture — not incremental or piecemeal changes — is required to address this threat."...

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Modernization and expansion of nuclear arsenals by the world's nine nuclear-armed nations continues despite the Treaty on the Prohibition of Nuclear Weapons (TPNW) which was adopted by 122 countries in 2017 and entered into force in 2021.

More Bombs, More Threats:

The B61-13 announcement comes as Congress appears prepared to fund a new U.S. nuclear sea-launched cruise missile, which is opposed by the Biden administration. Modernization and expansion of nuclear arsenals by the world's nine nuclear-armed nations continues despite the Treaty on the Prohibition of Nuclear Weapons (TPNW) which was adopted by 122 countries in 2017 and entered into force in 2021. The TPNW (also called "nuclear ban treaty") has been signed by 93 countries and ratified by 69 state parties. The treaty prohibits all aspects of nuclear weapons, from development and deployment to stockpiling and threat of use....

"I think people should be aware of the fact that countries — not just the U.S. but certainly this includes the U.S. — are planning on maintaining nuclear weapons for the next 60, 70, 80 years," said Korda. "Nuclear-armed countries are not planning on disarming any time soon. They're planning on keeping nuclear weapons around longer than many of us are going to be alive. If we want to push countries toward disarmament, that's going to be a long process." Korda said....

Source: <https://truthout.org/articles/disarmament-grows-more-distant-as-us-plans-another-upgrade-to-nuclear-bomb/>, 20 November 2023.

NUCLEAR ENERGY

CHINA

China's Nuclear Energy Heating Project Begins Operation

China's first nuclear energy heating project that covers multiple prefecture-level cities, has been put into operation in East China's Shandong province. The project, operated by the State Power Investment Corp (SPIC) is the third phase of the 900 MW nuclear power-based "Warm Nuclear No

1" project, which provides green heating to Shandong province's Haiyang and Rushan through a 23-kilometre main transport pipe. The pipe network will connect Yantai with Weihai in Shandong province.

The energy will be provided by the Haiyang NPP in Shandong, which has a heating system connected to units 1&2 of the plant. The system extracts non-radioactive steam from the secondary circuit of Haiyang's unit 2. This is then fed through a multi-stage heat exchanger at an on-site heat exchange station. The total heating area of the project will reach 12.5m square metres this winter, supplying heat to about 400,000 people. SPIC has been stepping up efforts to expand its nuclear power-based heating projects to more Chinese areas. The first phase of the nuclear heating project in Shandong began operation in 2019 and has provided 700,000 sq m of heating. This was followed by the second phase that covered 5m sq m in 2021. The third phase will cover 30m sq m and is eventually expected to meet heating demand of a million residents.

Total investment for the project is put at CNY700m (\$102m). The project also includes a heat source distribution centre that will apply intelligent scheduling management and a control platform for parameter monitoring, SPIC noted. Lin Boqiang, head of the China Institute for Studies in Energy Policy at Xiamen University said the project will provide valuable experience to further promote similar heating schemes throughout China.

SPIC ultimately expects to extend the heating area to the entire Jiaodong peninsula. "The heat pipe network marks the official start of China's first

long-distance nuclear energy heat supply pipeline network project across prefecture-level cities," SPIC said. Work began on the long-distance supply

pipe in February, and the project has required coordination and communication between the different provincial and municipal bodies involved. To date some 83 km of the nuclear energy heating main network and 11 first-level heat exchange stations have been

constructed at a cost of some CNY4bn (\$555m), SPIC said. ...

Source: <https://www.neimagazine.com/news/newschinas-nuclear-energy-heating-project-begins-operation-11334908>, 29 November 2023.

GENERAL

A Dozen Nations to Start Making Electricity from Nuclear Power, Says IAEA

In the coming years, twelve nations are anticipated to begin generating electricity using nuclear power, according to Rafael Mariano Grossi, the director general of the IAEA, who made this announcement. At the World Nuclear Exhibition in Paris, Grossi stated that the IAEA's estimates indicate that in order to meet the goals of the Paris climate agreement, the world's nuclear reactor count—which is now approximately 400 units—must be doubled. "We already have 10 countries which have entered the decision phase (to build nuclear power plants) and 17 others which are in the evaluation process," he stated. "There will be a dozen or 13 (new) nuclear countries within a few years," he stated. Grossi mentioned the Philippines, Kazakhstan, Uzbekistan, Nigeria, Namibia, Ghana, Kenya, Morocco, and Namibia as possible new nuclear powers.

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Source: <https://www.firstpost.com/world/a-dozen-nations-to-start-making-electricity-from-nuclear-power-says-iaea-13442022.html>, 28 November 2023.

IAEA Looks Ahead to the Future of Nuclear Law

The importance of national and international nuclear law was underscored in recent remarks by the IAEA DG Grossi, as countries increasingly plan to adopt or expand nuclear energy to their energy grids to meet the growing challenges of climate change and energy security. Grossi addressed lawyers, regulators and other officials from 54 countries around the world on 10 October as part of an intensive two-week training programme, known as the Nuclear Law Institute (NLI).

The annual two-week course was launched by the IAEA in 2011, in response to demand from countries around the world for greater capacity building in nuclear law. The course aims to equip participants with a solid understanding of all aspects of nuclear law and enable them to draft, amend or review national nuclear legislation. In the past year the IAEA has also launched a new fellowship programme in nuclear law. It has also partnered with six universities around the world to develop a graduate level curriculum in nuclear law, three of which were represented at this year's NLI.

During his keynote address on the future prospects of nuclear law Grossi said he attached "enormous importance" to the subject, particularly as the use of nuclear science and technology was gathering pace around the world... He stressed the importance of the establishment of comprehensive national legislative and regulatory frameworks for countries in the process of building their first nuclear power plants... .

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Hundreds of Lawmakers Trained: Peri Lynne Johnson, Legal Advisor and Director of the IAEA Office of Legal Affairs said "For more than a decade now, the NLI has been the go to course on legislative drafting for officials from IAEA Member States. More than 600 lawmakers, ranging from decision-makers and legislative drafters, to lawyers, regulators, parliamentarians, and other stakeholders, have been trained, with many going on to provide the much needed technical and legal support during the national law-making process."

... At the end of the course, groups of participants presented their drafts of a national nuclear law prepared during the course under a hypothetical country profile, explaining each article in the law, followed by a plenary session of questions from all participants and experts./

Source: <https://www.iaea.org/newscenter/news/iaea-looks-ahead-to-the-future-of-nuclear-law>, 15 November 2023.

According to the plan, the two reactors with a total installed capacity of 2,800 MWe will provide 22 TWh of energy annually, which corresponds to 12% of current electricity demand in Poland. The decision-in-principle is the first step in the process of administrative permits required for investments in nuclear power facilities in Poland.

POLAND

Poland Approves Second Large NPP

Poland's Ministry of Climate & Environment has issued a decision-in-principle for a second large NPP. Two South Korean-supplied APR1400 reactors are planned in the Patnów-Konin region of Wielkopolska province in central Poland. A positive decision by the Ministry of Culture & Higher Education makes it possible to start work at the site and confirms the compliance of the planned investment with the objectives of Poland's energy policy. According to the plan, the two reactors with a total installed capacity of 2,800 MWe will provide 22 TWh of energy annually, which corresponds to 12% of current electricity demand in Poland.

The decision-in-principle is the first step in the process of administrative permits required for investments in nuclear power facilities in Poland. It entitles ZE PAK and PGE to apply for a number of further administrative arrangements, such as a siting decision or construction licence.

PGE PAK Energia Jadrowa (PPEJ) submitted its application to the Ministry in June. PPEJ is a joint special purpose vehicle set up by Polish public company ZE PAK (Zespół Elektrowni Patnów-Adam-Konin) and Polska Grupa Energetyczna (PGE) – both Treasury owned – to implement the project to construct the NPP in Patnów. The plant will comprise two reactors supplied by Korea Hydro & Nuclear Power (KHNP). PPEJ was established just five months after the letter of intent was signed in Seoul in October 2022 between PGE, ZE PAK and KHNP. PGE and ZE PAK will each own 50% of the shares in PPEJ, which secures the interest of the Polish Treasury in the project.

Jacek Sasin, Poland's Minister of State Assets said energy security is the basis for the functioning of the state, and in view of the challenges related to energy transformation, only nuclear power can provide a stable basis in the coming years to ensure access to cheap and clean energy and support economic development. ...

This project is developing in parallel with Poland's official nuclear power programme. Poland has ambitious nuclear power development plans. In September 2021, it was announced that six large pressurised water reactors with a combined installed capacity of 6-9 GWe could be built by 2040 to reduce its reliance on coal. Construction

of the first 1.0-1.6 GWe plant was expected to start in 2026 for commissioning in 2033.

Subsequent units will be implemented every 2-3 years. In November 2022, the government announced the first plant, with a capacity of 3,750 MWe, would be built in Pomerania using US Westinghouse AP1000 technology. An agreement outlining a plan for delivery of the plant was signed in May by Westinghouse, Bechtel and state-owned Polish utility Polskie

Elektrownie Jadrowe (PEJ).

Source: <https://www.neimagazine.com/news/newspoland-approves-second-large-npp-11335518>, 29 November 2023.

SWEDEN

Swedish Parliament Clears Way for Possible Nuclear Energy Expansion

Sweden's parliament approved on Wednesday (29 Nov) a bill allowing more nuclear reactors to be built than previously planned, scrapping the previous cap of 10, as the Nordic country seeks to boost power generation and energy security. The new law will also allow construction of nuclear reactors at sites other than the current plants - Ringhals, Forsmark and Oskarshamn - where Sweden's fleet of six reactors is located. "The

Riksdag shares the government's assessment that fossil-free nuclear power will continue to play a central role in the Swedish energy mix," the parliament said in a statement. "The main reasons for this are an expected greater demand for electricity in combination with the need to phase out fossil fuels, not least for climate reasons," it added.

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Sweden's parliament approved on Wednesday (29 Nov) a bill allowing more nuclear reactors to be built than previously planned, scrapping the previous cap of 10, as the Nordic country seeks to boost power generation and energy security. The new law will also allow construction of nuclear reactors at sites other than the current plants - Ringhals, Forsmark and Oskarshamn - where Sweden's fleet of six reactors is located.

The legislation was put forward by Prime Minister Ulf Kristersson's government, which aims to build two new conventional nuclear reactors by 2035. Kristersson has made expanding nuclear power generation a key goal for his right-wing government, after closure of several reactors forced the country to rely more on less predictable renewable energy. On 29 Nov, an outage of Vattenfall's (VATN.UL) 1,130 MW Ringhals 4 nuclear reactor sent Swedish day-ahead power prices to almost one-year high as unusually cold weather drove up demand, illustrating the dependence.

Sweden voted in a referendum to get rid of nuclear power in 1980, and has only six of original 12 reactors still in operation. Concerns about energy security in the wake of Russia's invasion of Ukraine in February 2022 that caused a sharp increase in energy prices in Europe, have also played the role. The government predicts that electricity demand will more than double to around 300 TWh by 2045 due to the transition to a fossil energy-free society. By then, the current government wants to have 10 new reactors in place by that year, some of which could be SMRs.

Source: <https://www.reuters.com/world/europe/swedish-parliament-clears-way-possible-nuclear-energy-expansion-2023-11-29/>, 29 November 2023.

UAE

Fourth Barakah Unit Receives Operating License

The Federal Authority for Nuclear Regulation (FANR) said it had reached its decision to issue the license after conducting a thorough assessment of the application documentation, conducting robust regulatory oversight and inspections in the areas of safety, security and safeguards... Construction of the fourth Korean-designed APR-1400 unit at Barakah, in the Al Dhafra region of Abu Dhabi Emirate began in July

2015, three years after work began on the first Barakah unit.

The first three units are now fully operational under FANR's regulatory oversight. The UAE embarked on its plan to implement a nuclear energy programme in 2008 when its government made the decision to build and operate a nuclear power plant to provide 25% of the country's electricity needs, diversifying its energy sources and supporting its long-term energy vision and net zero goals.

Construction of the first unit began in 2012, and Barakah 1 was connected to the grid in 2020. "Today marks a historic moment for the UAE, where it realized its vision that started 15 years ago in developing the-first-in-the-region peaceful

The UAE embarked on its plan to implement a nuclear energy programme in 2008 when its government made the decision to build and operate a nuclear power plant to provide 25% of the country's electricity needs, diversifying its energy sources and supporting its long-term energy vision and net zero goals.

nuclear energy programme," Hamad Al Kaabi, the UAE's permanent representative to the IAEA and deputy chairman of FANR's Board of Management said... FANR has certified 215 Reactor Operators and Senior Reactor Operators - including 78 who are Emiratis - who are qualified

to operate the control rooms of the nuclear power plant, FANR Director General Christer Viktorsson said.

"The review of the operating licence application for Unit 4 was conducted by a team consisting of 90% Emirati nuclear experts. This indicates the success of FANR's strategy in building the capability and skills of Emiratis to regulate the nuclear sector and ensure its safe operation," Christer added... When the plant enters commercial operation the regulator will assume an oversight role. The Barakah plant is owned by the Emirates Nuclear Energy Corporation (ENEC) and operated by Nawah. Barakah 4's operating license has a duration of 60 years.

Source: <https://www.world-nuclear-news.org/Articles/Fourth-Barakah-unit-receives-operating-licence>, 17 November 2023.

USA

The Potential of Nuclear Fusion Energy as a Solution for Climate Change

The United States has taken a significant step towards promoting nuclear fusion energy by announcing its first international strategy for the mass commercialization of this innovative technology. Nuclear fusion differs from nuclear fission in the sense that it involves the process of pushing two atoms together, which produces no nuclear waste. In comparison, nuclear fission, the process of splitting atoms, is currently used for commercial energy but results in the creation of hazardous nuclear waste that requires secure storage.

In August, scientists in California successfully replicated the ignition of an atomic fusion process in their laboratories. This achievement has provided a crucial breakthrough for further scientific development in the field of nuclear fusion. It remains unclear whether this specific accomplishment is directly related to the upcoming U.S. commercialization plan, which will be revealed at the 28th COP28 in Dubai, United Arab Emirates.

The U.S. Special Envoy on Climate Change, John Kerry, expressed his optimism about nuclear fusion energy during a recent visit to the Commonwealth Fusion Systems (CFS) corporate headquarters in Massachusetts. He emphasized that fusion energy no longer remains confined to the realm of science experiments. Instead, it is emerging as a tangible climate solution owing to the significant investments made in fusion energy sciences programs by the Department of Energy. Nuclear

fusion energy holds immense potential as a cleaner and more sustainable energy source.

While the process is technologically complex and resource-intensive, it has the advantage of generating vast amounts of usable energy without leaving behind any hazardous waste. The U.S. plan to propel nuclear fusion energy towards mass commercialization is a crucial step forward in advancing both technological innovation and addressing climate change. Why is nuclear fusion considered a climate solution? Nuclear fusion is seen as a climate solution because it is a cleaner and more sustainable energy source compared to traditional methods. The process does not produce greenhouse gas emissions and does not leave behind any long-lasting radioactive waste.

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Source: <https://www.energyportal.eu/news/u-s-to-announce-nuclear-energy-plan-at-un-summit/531994/#gsc.tab=0>, 24 November 2023.

NASA Moves Closer to Use of Plutonium-238 to Power Space Missions

The shipment earlier this year of heat source plutonium-238 from the US DOE's Oak Ridge National Laboratory (ORNL) to its Los Alamos National Laboratory (LANL) represents a critical step toward fuelling planned space missions with radioisotope power systems, NASA had said. The shipment of 0.5 kilograms of new heat source plutonium oxide is the largest since the domestic restart of plutonium-238 production more than 10 years ago. "It marks a significant milestone toward achieving the constant rate production average target of 1.5 kilograms per year by 2026," NASA noted.

Radioisotope power systems (RPS) use the natural decay of the radioisotope plutonium-238 to provide heat to a spacecraft in the form of a Light Weight Radioisotope Heater Unit (LWRHU), or heat and electricity in the form of a system such as the Multi-Mission Radioisotope Thermoelectric Generator (MMRTG). RPS will enable exploration of some of the deepest, darkest, and most distant destinations in the solar system and beyond.

DOE has produced the heat source plutonium oxide required to fuel the RPS for missions such as NASA's Mars 2020. The first spacecraft to benefit from this restart, the Perseverance rover, carries some of the new plutonium produced by DOE. An MMRTG continuously provides the car-sized rover with heat and about 110 watts of electricity, enabling the exploration of the Martian surface and the gathering of soil samples for possible retrieval. ...

Source: <https://www.neimagazine.com/news/newsnasa-moves-closer-to-use-of-plutonium-238-to-power-space-missions-11335593>, 29 November 2023.

However, what's not addressed is that even after this hefty purchase, Norway will still fall short of having a truly comprehensive long-range air defense capable of warding off tactical ballistic missiles. Providing this may cost up to six times the current record allocation.

Particularly, The Mark II launcher's development was driven by the goal to facilitate multi-layered defense against air threats, inclusive of cruise missiles, in the Nasams system. With this missile in their arsenal, Nasams can achieve enhanced altitude coverage with the ability to engage with targets at a longer range.

this may cost up to six times the current record allocation. Gramm also highlights that the progression of air defense will be a key topic in the impending long-term plan.

Upgraded Nasams: So, what's the latest addition to Norway's military artillery? The Norwegian Armed Forces are now set to receive an upgraded variant of the Norwegian/National Advanced Surface to Air Missile System [NASAMS] air defense. These high-tech systems are produced by Kongsberg Defense & Aerospace [KDA] and the US-based Raytheon. The missiles to be included in this upgrade are the AIM-9X Sidewinder block 2, AIM-120C Amraam, and Amraam Extended Range [ER], all supplied by Raytheon, an American manufacturer. The acquisition was made possible by the US authorities through its Foreign Military Sales [FMS] program... .

The Multi-Missile: One of the distinguishing attributes that set the modern Nasams apart is its ability to launch three disparate types of missiles from a single launcher simultaneously. In

collaboration with the US AFRL for SDPE, this unique feature was showcased on Andøya a year ago... . Particularly, The Mark II launcher's development was driven by the goal to facilitate multi-layered defense against air threats, inclusive of cruise missiles, in the Nasams system. With this missile in their arsenal, Nasams can achieve enhanced altitude coverage with the ability to engage with targets at a longer range. This missile also improves upon the Amraam in the aspects of speed and maneuver.

NOK 80 Billion (\$7,3 Billion): Investing in long-range air defense systems is a pricey undertaking. The Defense Commission delineated the

BALLISTIC MISSILE DEFENCE

NORWAY

Norway 'Forgot' to Build a Long-Range Anti-Ballistic Missile Defense

Early on 15 November 2023, the announcement came that the government would be funneling NOK 12.5 billion [\$1,1 billion] into bolstering Norway's aerial defense system.... However, what's not addressed is that even after this hefty purchase, Norway will still fall short of having a truly comprehensive long-range air defense capable of warding off tactical ballistic missiles. Providing

monetary commitment required to implement the advice of the preceding two military councils....

Source: <https://bulgarianmilitary.com/2023/11/16/norway-forgot-to-build-a-long-range-anti-ballistic-missile-defense/>, 16 November 2023.

NUCLEAR ENERGY

CHINA

Work on Xudabao Unit 1 Gets Under Way

The construction of units 1 and 2 of the Xudabao (also known as Xudapu) plant was approved by China's State Council on 31 July 2023. On 6 November, the Ministry of Ecology and Environment announced that the National Nuclear Safety Administration had decided to issue a construction licence for Xudabao units 1 and 2, which will both feature 1250 MWe CAP1000 reactors – the Chinese version of the Westinghouse AP1000. A ceremony was held on 15 November at the Xudabao site near Xingcheng City, Huludao, to mark the start of construction of unit 1.

The Xudabao project was originally expected to comprise six CAP1000 reactors, with units 1 and 2 in the first phase.... China National Nuclear Corporation (CNNC) noted the total investment in the units 1 and 2 projects exceeds CNY48 billion (USD6.6 billion). "After the nuclear island project of unit 1 starts, the project will enter the comprehensive construction stage," CNNC said. The two units are planned to be put into production in 2028 and 2029, respectively. With construction of Xudabao 1 under way, CNNC now has ten reactors being built in China, with a combined generating capacity of 11.42 GWe.... After all the six units of the Xudabao plant are

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State-owned engineering firm BHEL has signed a MoC with the French company EDF to explore the opportunity to maximize the local content for the Jaitapur nuclear power project in Maharashtra. In regulatory filings with the NSE and the BSE, the BHEL said that it will "explore the opportunity to maximise the local content of the JNPP", being set up by the NPCIL.

put into operation, they will provide more than 54 TWh of clean electricity every year, saving about 19.2 million tonnes of coal annually, and reducing carbon dioxide emissions by about 56.7 million tonnes annually, CNNC said.

Source: <https://www.world-nuclear-news.org/Articles/Work-on-Xudabao-unit-1-gets-under-way>, 16 November 2023.

INDIA

BHEL to Collaborate with EDF France on Jaitapur Plant Even as Nuclear Liability Issues Remain Unresolved

State-owned engineering firm BHEL has signed a MoC with the French company EDF to explore the opportunity to maximize the local content for the Jaitapur nuclear power project in Maharashtra. In regulatory filings with the NSE and the BSE, the BHEL said that it will "explore the opportunity to maximise the local content of the JNPP", being set up by the NPCIL.

Proposed to be setup at Jaitapur in Ratnagiri district of Maharashtra, the JNPP would comprise six EPRs of 1,650 MWe each, which would make it the largest nuclear power plant in the world, with a total capacity of 9.6 GW. Over a decade ago, the UPA government initiated the idea of importing six EPR nuclear plants. However, the project had made little progress due to concerns about the economics and safety of the EPRs, local opposition, and the collapse of the initial French corporate partner, Areva.

... According to the agreement, the French side will offer an economically competitive financing package and ensure a steady supply of fuel throughout the operational lifespan of the Jaitapur nuclear power plants. Moreover, the agreement

specified cooperation in the transfer of technology and cost-effective localization efforts for manufacturing in India - latter including mutual agreement on the transfer of technology rights.

After 11 years of being on the drawing board, the project made a major headway in April 2021, when EDF submitted to NPCIL its binding techno-commercial offer to build six reactors at Jaitapur. However, since then, the project has remained stuck over several issues, including liability, high cost of power per unit among others.

According to an EDF official, the issue, arising from India's Civil Liability for Nuclear Damage Act that India passed in 2010, remains an item on the "agenda for both countries". The CLND Act 2010, brought in addition to the International Convention on Supplementary Compensation (CSC), is perceived as overly stringent by foreign companies, due to the potential liability of having to pay hundreds of millions of dollars in the event of a nuclear accident. Consequently, despite having entered into civil nuclear agreements with various countries, including the U.S., France, and Japan, the only foreign involvement in India is that of Russia in Kudankulam, projects that predate the Law.

Source: <https://swarajyamag.com/infrastructure/bhel-to-collaborate-with-edf-france-on-jaitapur-plant-even-as-nuclear-liability-issues-remain-unresolved>, 29 November 2023.

SWEDEN

Sweden Plans 'Massive' Expansion of Nuclear Energy

In October last year, Sweden's incoming centre-right coalition government adopted a positive stance towards nuclear energy, with the Christian Democrats, the Liberals, the Moderates and the Sweden Democrats releasing their written agreement on policies - referred to as the Tidö Agreement.... The agreement also said necessary

regulations should be developed to create the conditions for the construction and operation of small modular reactors in Sweden.

In addition, the permitting process for nuclear power plants must be shortened. In January this year, a formal proposal to amend Sweden's legislation on nuclear power was presented by Prime Minister Ulf Kristersson and Climate and Environment Minister Romina Pourmokhtari. It aims to remove the current law limiting to 10 the number of reactors in operation, as well as allowing reactors to be built on new sites, rather than just existing ones... . The government has now presented a roadmap for new nuclear power in Sweden, which it says "clarifies the government's target and provides long-term conditions for new nuclear power".

In January this year, a formal proposal to amend Sweden's legislation on nuclear power was presented by Prime Minister Ulf Kristersson and Climate and Environment Minister Romina Pourmokhtari. It aims to remove the current law limiting to 10 the number of reactors in operation, as well as allowing reactors to be built on new sites, rather than just existing ones.

The roadmap includes an in-depth agreement on four points. Firstly, it calls for the government to appoint a nuclear power coordinator who will support the work of removing obstacles, facilitating and promoting new nuclear power. In addition, the coordinator

will identify the need for additional measures. An important role for the coordinator will be to gather all relevant parties to get a clear direction for effective expansion.

Secondly, the state's financial responsibility needs to be clarified through a risk-sharing model. The government has previously proposed that government credit guarantees for SEK400 billion (USD38 billion) be introduced for nuclear power. However, the government has assessed that these credit guarantees alone will not be enough to stimulate new production.

In order to strengthen the conditions and provide additional incentives to invest in nuclear power, an investigator must propose a risk-sharing and financing model where the state shares the risk. The government has instructed the National Debt Office to take preparatory measures to be able to issue government credit guarantees for

investments in new nuclear power... . As part of the assignment, the National Debt Office must make an assessment of how credit guarantees for investments in new nuclear power affect the risk in the combined guarantee portfolio.

Thirdly, the new policy will make it possible for new nuclear power with a total output of at least 2500 MWe to be brought online by 2035 at the latest. Fourthly, it paves the way for a "massive expansion of new nuclear power by 2045". "Given the long-term needs for fossil-free electricity until 2045, an expansion is needed that could, for example, correspond to ten new large-scale reactors," the government said.

It noted that the exact amount and type of reactors needed "depends on several things, including the need and rate of expansion in the electricity system, technological development, and where in the country new consumption and production are located". "We are now delivering a pearl string of decisions to pave the way for new nuclear power," said Deputy Prime Minister and Minister for Energy, Business and Industry Ebba Busch. ...

Source: <https://www.world-nuclear-news.org/Articles/Roadmap-launched-for-expansion-of-nuclear-energy-i>, 17 November 2023.

SMALL MODULAR REACTOR

GENERAL

WANO Urges Early Membership for SMR Projects

WANO is a not-for-profit international organization established in 1989 by the world's nuclear power operators.... Naoki Chigusa, WANO CEO, said that experts had undertaken 159 New

Unit Assistance missions to the 53 units since 2015 which have started-up in both existing and newcomer nuclear energy countries. Chigusa said: "By receiving support from WANO, our members have demonstrated higher levels of operational readiness, ensuring safe and reliable start-up and strong operational performance. We encourage those organizations that are constructing and preparing to operate new units - whether they are using traditional reactor technologies or innovations such as small modular reactors - to join WANO early. This will ensure that they can benefit from our expertise and experience many years before commercial start-up and enable them to start up safely and reliably." ...

Source: <https://www.world-nuclear-news.org/Articles/WANO-urges-SMR-developers-to-sign-up-early>, 16 November 2023.

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In a historic ruling, the Nuclear Regulatory Commission certified the design of NuScale's 50-megawatt power module, the first small modular reactor and just the seventh reactor design. Fast forward nearly 10 months and the wind appears to have left the sails of this budding carbon-free power source, specifically the future of advanced small modular reactors, or SMRs.

Small-Scale Nuclear Power Dealt Major Setback

...In a historic ruling, the Nuclear Regulatory Commission certified the design of NuScale's 50-megawatt power module, the first small modular reactor and just the seventh reactor design. Fast forward nearly 10 months and the wind appears to have left the sails of this budding carbon-free power source, specifically the future of advanced small modular reactors, or SMRs.

"The Utah Associated Municipal Power Systems' project using NuScale Power's SMR design has been terminated because it couldn't secure enough subscriptions from utilities in the Western US to make the project work financially, according to a release and NuScale's third-quarter 2023 earnings report," reports Wesoff, editorial director at *Canary Media* on November 9 in the source article... .

Loss for Idaho Falls and Federal Government:

In 2020, the UAMPS project in Idaho received \$1.35 billion from the U.S. Department of Energy as a cost-share award. It is unclear how much of that sum has already been spent or will have to be repaid. The SMR-maker has agreed to pay UAMPS a termination fee of \$49.8 million, according to Bloomberg.

According to the Utah Associated Municipal Power Systems' description of its Carbon Free Power Project, the nuclear power from the NuScale SMR would be 'dispatchable,' an energy term that was critical on Election Day in Texas, explained Maxine Joselow for The Washington Post on Nov. 7.

Dispatchable Generation? According to the Utah Associated Municipal Power Systems' description of its Carbon Free Power Project, the nuclear power from the NuScale SMR would be 'dispatchable,' an energy term that was critical on Election Day in Texas, explained Maxine Joselow for The Washington Post on Nov. 7....

Geothermal Alternative?

The Institute for Energy Economics and Financial Analysis published a brief on January 10 advising the Utah Associated Municipal Power Systems to forgo the small modular reactor route due to financial reasons and instead consider a renewable source for both baseload ('round-the-clock') and dispatchable generation. A Nevada geothermal proposal [by NV Energy] has the potential to be a less expensive, more certain option for a Utah utility than an unproven SMR with rising costs... .

US President Joe Biden's ambition to finally fructify the 2005 civil nuclear agreement cannot end with the sale of US nuclear reactors to India. Rather, it must extend to revising long-standing US policies that continue to make the existence of India's nuclear weapons programme an insuperable obstacle to deepened technological cooperation.

Source: <https://www.planetizen.com/news/2023/11/126331-small-scale-nuclear-power-dealt-major-setback>, 15 November 2023.

NUCLEAR COOPERATION

INDIA-USA

Full Potential of India-US Civil Nuclear Deal Remains Untapped: Expert

More than 18 years after India and the US signed a civil nuclear deal, its full potential and promise along with the larger bilateral partnership is yet

to be realised, according to a top American expert. While New Delhi is yet to remove obstacles that prevent its purchase of nuclear reactors from the United States, Washington has not been able to match the policy with vision, Ashley J Tellis, the Tata Chair for Strategic Affairs and a senior fellow at the Carnegie Endowment for International Peace, said.

US President Joe Biden's ambition to finally fructify the 2005 civil nuclear agreement cannot end with the sale of US nuclear reactors to India. Rather, it must extend to revising long-standing US policies that continue to make the existence of India's nuclear weapons programme an insuperable obstacle to deepened technological cooperation, he asserted in an opinion piece published by Carnegie Endowment for International Peace on Monday (27 Nov).

"Where India is concerned, New Delhi is long overdue in removing the obstacles that prevent its purchase of nuclear reactors from the United States, consistent with the written commitments it made

during the implementation of the nuclear deal. Where the United States is concerned, a different challenge persists that is no less urgent: matching policy with vision," he added.

Tellis noted that after Biden's visit to India in September, the joint statement declared that the two leaders 'welcomed intensified consultations between the relevant entities on both sides to expand opportunities for facilitating India-US collaboration in nuclear energy, including in development of next-generation small modular reactor technologies in a collaborative mode'.

Realising this promise, however, will require solutions that have eluded the two sides thus far, said the Indian-American expert. Westinghouse, the supplier of high-output nuclear power plants, remains skittish about sales to India with the

absence of a durable assurance of limited liability in the event of an accident. At least one other American company, Holtec International, which supplies SMRs, already operates a components factory in India and is eager to explore SMR sales in the country and across West Asia but these discussions are still in the early stages.

According to Tellis, even as India looks for ways to realise the commercial promise of the civil nuclear agreement - an objective that the Biden administration must be congratulated for making its own - the administration still has another bigger and more consequential task arising out of this accord: addressing the issue of India's nuclear weapons programme in the US grand strategy.

Given the Biden administration's interest in consummating the civil nuclear agreement, as well as India's interest in expanding foreign participation in its nuclear energy programme, it is past time for the Modi government to rectify the nuclear liability problems that it has inherited ironically due to the obstructiveness of Modi's own party, albeit long before he led it, Tellis wrote. The cleanest solution to the current predicament would be to amend India's Civil Liability for Nuclear Damage Act (CLNDA) to bring it in line with the Convention on Supplementary Compensation for Nuclear Damage (CSC) by channelling all liability in case of a nuclear accident solely to the operator of a nuclear plant, with the operator in turn protecting its interests by relying on an insurance pool for financial safety. India has already moved to create such an insurance pool pursuant to the CLNDA but it has not been fully funded yet, he wrote.

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This agreement lays out a comprehensive framework for peaceful nuclear cooperation between the Philippines and United States based on a mutual commitment to nuclear nonproliferation and is required by U.S. law to allow for the transfer of nuclear equipment and material for peaceful uses. With access to U.S. material and equipment, the U.S. and the Philippines will be able to work together to deploy advanced new technologies, including small modular reactors, to support climate goals as well as critical energy security and baseload power needs within the Philippines.

administration and the US Congress are of one mind. Consequently, it is now time for the executive branch to bring its application of the nonproliferation rules in accord with its core strategic goal of building Indian capabilities to effectively resist expanding Chinese power," he asserted.

Tellis said the inherited nonproliferation rules and how they are implemented not only prevent India from enjoying the full benefits of the agreement but even more importantly, subvert the overarching objective that drove its negotiation - assisting India's ascendancy to create the Asian multipolarity that balances China's rise. On this count, both the

Source: <https://www.deccanherald.com/india/full-potential-of-india-us-civil-nuclear-deal-remains-untapped-expert-2785986>, 27 November 2023.

USA-PHILIPPINES

United States Signs Civil Nuclear Cooperation Agreement with the Philippines/

Today, on November 16, 2023, the United States and the Philippines signed a civil nuclear cooperation agreement, commonly

known as a "123 Agreement," at the Asia-Pacific Economic Cooperation (APEC) Summit in San Francisco. Upon entry into force, the agreement will facilitate and enhance our cooperation on clean energy security and strengthen our alliance. This signing marks the successful culmination of the negotiation process launched by Vice President Kamala Harris during her historic trip to the Philippines in November 2022.

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commitment to nuclear nonproliferation and is required by U.S. law to allow for the transfer of nuclear equipment and material for peaceful uses. With access to U.S. material and equipment, the U.S. and the Philippines will be able to work together to deploy advanced new technologies, including small modular reactors, to support climate goals as well as critical energy security and baseload power needs within the Philippines.

This agreement also establishes nonproliferation criteria that both governments must uphold such as observing specific standards for covered items used in civil nuclear energy programs, including IAEA safeguards; physical protection of covered items; and limitations on enriching, reprocessing, and transferring specific items without the other Party's consent.

Source: <https://www.state.gov/united-states-signs-civil-nuclear-cooperation-agreement-with-the-philippines/>, 16 November 2023.

Around 10% of electricity worldwide is produced from uranium in nuclear reactors. This corresponds to an annual electricity production of over 2,500 terawatt-hours. There are currently 412 reactors operating in 32 countries across the globe, with a total installed capacity of around 370 GW, according to the IAEA's data.

According to the World Nuclear Association, around 10% of electricity worldwide is produced from uranium in nuclear reactors. This corresponds to an annual electricity production of over 2,500 terawatt-hours. There are currently 412 reactors operating in 32 countries across the globe, with a total installed capacity of around 370 GW, according to the IAEA's data... Kazakhstan leads in uranium mining. The quantity of uranium produced worldwide last year totaled 49,355 tons.

Kazakhstan is considered to be the largest supplier of uranium in the world. With a production rate of 21,227 tons last year, the nation alone satisfied 43% of the world's uranium needs. With a production of 7,351 tons, Canada accounted for 15% of the overall supply, while Namibia—which possesses the greatest uranium reserves in Africa—met 11% with 5,613 tons. Despite possessing the biggest uranium deposits globally, Australia's production of 4,553 tons only covered 9% of the world's total supply.

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Australia's production of 4,553 tons only covered 9% of the world's total supply.

Uzbekistan, Russia, Niger, China, India, South Africa, Ukraine, the US, Pakistan, Brazil and Iran were among the other countries that produced uranium last year. The US, with the largest nuclear fleet of 93 reactors, produced only 75 tons of uranium last year. France, which derives around 63% of its electricity from nuclear energy, has failed to produce uranium since 2015, when output totaled 2 tons.

Source: <https://www.aa.com.tr/en/energy/nuclear/uranium-demand-increases-with-greater-trend-towards-nuclear-energy/39253#>, 15 November 2023.

URANIUM PRODUCTION

GENERAL

Uranium Demand Increases with Greater Trend Towards Nuclear Energy

Investments in nuclear energy have soared, along with demand for uranium, as a result of surging global energy prices and ambitious climate targets around the world. As uranium is used in so many industries and fields—from nuclear energy to medicine to the military—its significance has once again become apparent as prices have risen as a result of high demand, limited supply and depleted stock.

NUCLEAR SAFETY

GENERAL

IAEA Hosts the First Meeting Focusing on Safety and Regulation of Fusion

More than 100 representatives from 23 countries and three international organizations shared their experiences on the safety and regulation of fusion facilities during a technical meeting on fusion design safety and regulation at the IAEA's headquarters in Vienna from 23 to 25 October 2023. "Following on from recent scientific breakthroughs in fusion science, both public and private sector ventures are now looking to move away from experimental fusion devices and towards prototype and commercial fusion power plants," said Kirsi Alm Lytz, Head of the IAEA Regulatory Activities Section, during the opening remarks at the meeting. "As the scale and nature of fusion facilities evolve, our regulations and safety approaches must evolve with them," Kirsi said.

Participants delivered presentations on general safety approaches; safety cases for demonstration fusion power plants; and technology inclusive safety assessment methodologies as well as fusion specific hazards such as tritium and decay heat. Participants from national regulatory bodies provided information on the latest decisions on national regulatory frameworks for fusion, while those from the private sector provided their perspectives on what a proportionate regulation of fusion might look like in the coming years.

This was an important aspect of the meeting because regulatory frameworks suitable for nuclear power plants may not be suitable to

regulate fusion facilities. The meeting covered the challenges associated with design safety, safety assessment and regulation of fusion power plants and early-stage fusion facilities; the outcomes from these discussions will be addressed in the development of IAEA safety reports on fusion safety and regulation, as well as in the development of fusion-specific safety standards.

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As noted by Francisco Castejon, a Commissioner from the Spanish Nuclear Council, "It has been excellent to participate in this technical meeting. The discussions have been really fruitful, and we can say that we have envisaged how to establish the route towards a harmonized fusion regulation. We have also had the opportunity of

discussing the different strategies around the world to achieving commercial fusion."

Emphasizing the central role of the IAEA in this advanced technology, Sally Forbes, Fusion Safety Advisor of the United Kingdom Atomic Energy

The IAEA Division of Nuclear Installation Safety is developing two TECDOCs on fusion safety and regulation and will soon begin work on the development of a Safety Report that will set out expectations for the safety and regulation of fusion. The IAEA aims to start developing fusion-specific safety standards later this decade, commensurate with the pace of the development of the technology.

Authority, added that "the IAEA is central in being able to capture and consolidate this knowledge into fusion standards, with the aim of achieving a degree of standardization in design safety internationally. Alongside this, seeking high level harmonization of regulatory frameworks for fusion via

IAEA standards, will aid development and deployment of fusion energy systems globally in the future."

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fusion-specific safety standards later this decade, commensurate with the pace of the development of the technology. These safety standards will represent the consensus opinion of IAEA's Member States as to what is an appropriate set of requirements, and later guidance, for the safety and regulation of fusion facilities. "This technical meeting has been really timely. The meeting marks the beginning of our next chapter on fusion design safety, safety assessment and regulation," said Ana Gomez Cobo, Head of the IAEA Safety Assessment Section in her closing remarks at the meeting....

Source: <https://www.iaea.org/newscenter/news/iaea-hosts-the-first-meeting-focusing-on-safety-and-regulation-of-fusion>, 15 November 2023.

Enhancing National Safeguards Infrastructure to Support the Introduction of Nuclear Power

The decision to establish a nuclear power programme is a significant undertaking by any country. Such a decision should be based on a commitment by the government to use nuclear power safely, securely and peacefully. This commitment requires establishing a sustainable national infrastructure including robust safeguards infrastructure supporting the functions of the State system of accounting for and control of nuclear material (SSAC). The IAEA has developed the Milestones Approach to help Member States embarking on nuclear power to plan and develop the necessary infrastructure in a phased way.

Safeguards is one of the 19 infrastructure issues described in the Milestones Approach. The primary objective of this work is to provide guidance and references for safeguards related activities that need to be carried out during each of the three phases of nuclear power infrastructure development in line with the nuclear power programme implementation. This work includes several case studies from different

countries on how they developed their national safeguards infrastructure to meet the requirements of their nuclear power programmes.

Source: <https://www.iaea.org/publications/15209/enhancing-national-safeguards-infrastructure-to-support-the-introduction-of-nuclear-power>, 2023.

RUSSIA

IAEA Sees Operational Safety Commitment at Beloyarsk Nuclear Power Plant in Russia, Encourages Continued Improvement

An IAEA team of experts said that the operator of the Beloyarsk Nuclear Power Plant in the Russian Federation has shown a commitment to enhancing operational safety. The team also encouraged the

operator to further improve safety in areas including accident management and safety assessments.... OSART missions independently assesses safety performance against the IAEA's safety standards.

The aim is to advance operational safety by proposing recommendations and, where appropriate,

suggestions for improvement. Safety is an essential element during commissioning and the subsequent safe operation of a nuclear power plant.... To make its assessment, the team reviewed documents from the Beloyarsk plant on its main technical features, staff organization and responsibilities, and its operational programmes, procedures and performance prior to the mission.

During the mission, the team observed the plant in operation, examined indicators of its performance and held in-depth discussions with plant personnel. The OSART team observed that the staff at the plant are knowledgeable and professional, and are committed to improving the operational safety and reliability of the plant. The team said that the technical exchanges with the plant's staff were fruitful and that there was a good exchange of experience and knowledge on

The OSART team observed that the staff at the plant are knowledgeable and professional, and are committed to improving the operational safety and reliability of the plant. The team said that the technical exchanges with the plant's staff were fruitful and that there was a good exchange of experience and knowledge on how the common goal of excellence in operational safety could be further enhanced.

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The team identified one area of good practice to be shared with the nuclear industry globally. They said the connection used by the plant to sample gases in the reactor circuit minimizes the potential for impurities to impact the gas analysis, whilst ensuring that the gas does not escape into the work area.

The mission also provided some suggestions to further improve safety, including that:

1. The plant should consider enhancing its accident management programme to include the full range of 'beyond design' external hazards for all modes and states of operation and all fuel locations on site.

2. The plant should consider extending the scope of its probabilistic safety assessments (PSA) to ensure that all potential failure scenarios are identified to cover all operational modes, all fuel locations on site as well as the full spectrum of external hazards.

3. The plant should consider improving the effectiveness of the checks carried out during field operator walkdowns, so all deficiencies and adverse conditions are identified to ensure safe and reliable operation of plant structures, systems and components.

"It is the first time an IAEA OSART mission was held at the power unit of a BN-800 fast neutron reactor," said Ivan Sidorov, Director of Beloyarsk NPP. "For three weeks, the reviewers and the counterparts have worked hard, performing dozens of plant tours, interviews and observations, and analysing plant documentation for all reviewing areas. We appreciate the reviewers' professional point of view, and we are ready to learn from their experience to improve safety at Beloyarsk NPP." Ivan said. The team provided a draft report of the mission to the plant management. They will have the opportunity to make factual comments on the draft. These comments will be reviewed by the IAEA, and the

final report will be submitted to the Government within three months....

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-sees-operational-safety-commitment-at-beloyarsk-nuclear-power-plant-in-russia-encourages-continued-improvement>, 23 November 2023.

SWEDEN

IAEA Concludes Long Term Operational Safety Review at Sweden's Forsmark Nuclear Power Plant

An IAEA team of experts last week completed a review of long term operational safety at the Forsmark Nuclear Power Plant (NPP) in Sweden. Unit 1 and 2 at Forsmark NPP went into commercial

operation in 1980 and 1981, respectively... . The mission, requested by the Swedish Radiation Safety Authority (SSM), continues a comprehensive, multi-year evaluation of the two units.

In 2016, SSM invited an IAEA pre-SALTO mission to review the long term safety

of the two units, followed by another pre-SALTO mission in 2019 and a follow-up mission in 2021. During the recent ten-day mission from 7 to 16 November, the team reviewed the plant's preparedness, organization and programmes for safe LTO of the two units... . The team met and had in depth discussions with staff from the Forsmark NPP and conducted a plant walkdown during the review.

"The team observed that the operator is implementing measures for safe LTO in a timely manner and the staff at the plant are professional, open and receptive to suggestions for improvement," said team leader and IAEA Nuclear Safety Officer Martin Marchena, adding that "most of the ageing management and LTO activities are already in alignment with IAEA safety standards. We encourage the plant to address the review findings and implement all remaining activities for safe LTO as planned."

The team identified good practices and good performances that will be shared with the nuclear industry globally, including:

An IAEA team of experts last week completed a review of long term operational safety at the Forsmark Nuclear Power Plant (NPP) in Sweden. The mission, requested by the Swedish Radiation Safety Authority (SSM), continues a comprehensive, multi-year evaluation of the two units.

- The plant developed and implemented a detailed process for the identification of components not directly important to safety that may influence intended functions of safety components.
- The plant developed and implemented a comprehensive obsolescence management programme.
- The plant developed a programme to coordinate specialist activities to foster the growth of a specialized workforce in specific areas, such as ageing management.

The team also provided recommendations to further enhance the preparations for LTO safety:

- The plant should address some of the remaining elements in plant programmes to ensure effectiveness in ageing management.
- The plant should improve the grouping of components for implementation of ageing management activities (so called commodity groups).
- The plant should improve ageing management programmes for civil structures, systems and components for LTO.

The plant management expressed a determination to address the areas identified for improvement and to continue its cooperation with the IAEA. ...

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-concludes-long-term-operational-safety-review-at-swedens-forsmark-nuclear-power-plant-1>, 20 November 2023.

TURKMENISTAN

Turkmenistan Joins International Nuclear Safety Conventions

Turkmenistan officially joined international conventions on nuclear safety during a ceremony held at the IAEA headquarters in Vienna, Austria, on November 14. The Turkmen Ambassador to

Austria, Hemra Amannazarov, presented documents to IAEA DG Grossi, signifying Turkmenistan's accession to the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, according to the Turkmen Foreign Ministry.

Negotiations between the two parties took place during the ceremony, with both sides offering a positive assessment of the ongoing cooperation between Turkmenistan and the IAEA. They also exchanged views on the tasks to be accomplished in the relevant areas of cooperation.... The

The Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency were adopted in 1986. They aim to ensure the swift and effective exchange of information and assistance between states in the event of nuclear or radiation accidents that may have transboundary consequences for human health and the environment.

Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency were adopted in 1986. They aim to ensure the swift and effective exchange of information and assistance between states in the event of

nuclear or radiation accidents that may have transboundary consequences for human health and the environment....

Source: <https://caspiannews.com/news-detail/turkmenistan-joins-international-nuclear-safety-conventions-2023-11-17-0/>, 17 November 2023.

UKRAINE

Update 194 – IAEA Director General Statement on Situation in Ukraine

A reactor unit of Ukraine's Zaporizhzhya Nuclear Power Plant (ZNPP) temporarily lost power earlier this week, forcing it to rely on an emergency diesel generator for the electricity it needs for cooling and other vital functions, DG Grossi of the IAEA said on 17 November 2023. The ZNPP is investigating the cause of the 90-minute power outage that occurred late on 15 November 2023 at reactor unit 6.

The IAEA experts at the site are also gathering information to make their own independent assessment. The affected unit is in cold shutdown,

but still needs access to power. None of the ZNPP's five other reactors lost power, three of which are also in cold shutdown, while two are in hot shutdown to generate steam and heating. "While this was not a total loss of off-site power, as we have seen seven times before during the conflict, it once again highlights the precarious nuclear safety and security situation at the Zaporizhzhya Nuclear Power Plant," Grossi said. "The IAEA will continue to collect information so we can inform the international community about the situation at the plant." Grossi said.

The day after the power outage, the ZNPP informed the IAEA experts that part of the safety system of the same unit was placed under planned maintenance. The ZNPP continues to be connected to the electricity grid through a single 750 kV main power line – out of four before the conflict – as well as a back-up 330 kV line, compared with six less than two years ago. IAEA experts present at the ZNPP are continuing to hear explosions on a near-daily basis some distance away from the site, on the frontline of the conflict.

Separately, the IAEA experts have been informed that the chemical boron has been detected in the secondary cooling circuit of one of the steam generators of reactor unit 5, which is currently in hot shutdown. Borated water is used in the primary coolant to help maintain nuclear safety. The site has increased the frequency of boron measurements in the secondary cooling circuit of unit 5. The measurements remain relatively stable and are within the limits permitted by the reactor's

technical specifications. No radioactivity has been detected in the secondary cooling circuit.

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The ZNPP stated that, as the boron concentration remains within the allowable limits, the site intends to keep unit 5 in hot shutdown, which will be reassessed after all the boilers, used for heating in the nearby town of Enerhodar, have started operating. At that time, the site will determine whether to move unit 5 to cold shutdown. The ZNPP has been keeping reactor units 4 and 5 in hot shutdown to provide heating and steam for nuclear safety purposes on site... .

The IAEA continues to follow the ZNPP's progress to find an alternative source of steam generation. Ukraine's national regulator, the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU), issued regulatory orders in June to limit the operation of all six units of the ZNPP to a cold shutdown state. In other activities conducted by the

In other activities conducted by the IAEA experts over the past week, the team performed – for the first time – a walkdown on 15 November 2023 of all six main reactor control rooms at the ZNPP, one after the other. It provided the team with an opportunity to gather more information about staffing there and to confirm the status of each reactor unit.

IAEA experts over the past week, the team performed – for the first time – a walkdown on 15 November 2023 of all six main reactor control rooms at the ZNPP, one after the other. It provided the team with an opportunity to gather more information about staffing there and to confirm the status of each reactor unit. "This has been a positive development regarding access. I strongly encourage the plant to ensure that timely access and information sharing take place regularly. It will enhance our capability to report about the overall situation at the plant," Grossi said.

The same day, the IAEA experts also conducted a

walkdown of the turbine hall of unit 5, but their access was partially restricted, as was the case also during a visit to the turbine hall of unit 1 last week, and of the turbine halls of units 1, 2, 4 and 5 during walkdowns in October. The IAEA experts continue to request access to all six turbine halls together as part of their activities to monitor compliance to the seven indispensable pillars and the five concrete principles for protecting the ZNPP.

IAEA experts observed an emergency exercise conducted at the Rivne Nuclear Power Plant (NPP) on 15 and 16 November, which also included support from staff at the South Ukraine and Khmelnytsky NPPs. The IAEA has teams continually present at these three plants, who followed the different aspects of the exercise, at the Rivne NPP from both the onsite and offsite emergency control room.

to discuss the conduct of the exercise, document lessons learned and to identify areas for improvement.

The ZNPP plans to conduct an emergency exercise next week, which the IAEA team will also observe. The IAEA teams at the Khmelnytsky, Rivne and South Ukraine NPPs and the Chernobyl site report safe and secure operations of these nuclear facilities despite the continuation of the conflict.

Following last month's closure of the reactor vessel of unit 3, the plant informed the IAEA experts this week that testing of the reactor's primary cooling circuit was completed, and pressure testing of the secondary cooling circuit is expected to be completed in the coming days. Over the past week, up to seven of the nine mobile diesel boilers installed at the ZNPP to provide additional heating during the winter have been in operation most days. Their usage depends on the requirements for steam at the plant and for heating in Enerhodar.

Elsewhere in Ukraine this week, IAEA experts observed an emergency exercise conducted at the Rivne Nuclear Power Plant (NPP) on 15 and 16 November, which also included support from staff at the South Ukraine and Khmelnytsky NPPs. The IAEA has teams continually present at these three plants, who followed the different aspects of the exercise, at the Rivne NPP from both the onsite and offsite emergency control room.

During the exercise, the SNRIU – the Ukrainian Competent Authority under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency – shared information with the IAEA's Incident and Emergency Centre. Following the emergency exercise, the Rivne NPP conducted a debriefing

Source: <https://www.iaea.org/newscenter/pressreleases/update-194-iaea-director-general-statement-on-situation-in-ukraine>, 17 November 2023.

NUCLEAR WASTE MANAGEMENT

GENERAL

Storing the Most Dangerous Materials on Earth: How Modelling is Unlocking the Potential of Nuclear Power

This year, leaders from around the world met at the IAEA's Scientific Forum to agree the important role nuclear energy will play in mitigating the climate crisis. The momentum for nuclear energy already exists, with the energy source already providing about 10% of the world's electricity. But radioactive waste from nuclear power plants has been one of the most significant environmental challenges of recent decades. Spent fuel from nuclear reactors remains highly radioactive – and dangerous – for hundreds of thousands of years.

With the need for reliable low-carbon power more crucial than ever, researchers need to find ways to ensure nuclear is a safe, viable option. How do we effectively model how radioactive waste affects materials, so we can design safer storage methods? I lead an interdisciplinary team at Queen Mary University of London that is leading

research into safer nuclear waste storage. Our team's work addresses limitations in the standard software used to model radiation damage on different materials. These new modelling methods are reshaping international policy on the safe disposal of nuclear waste and enabling real-world advancements to make nuclear energy a more viable source of low-carbon energy.

Material Modelling on the Fly:

Identifying new ways to store nuclear waste requires molecular dynamics simulation, to help researchers model how materials interact with radioactive matter. But current software can't efficiently simulate or analyse large file sizes. And it doesn't have the necessary algorithms for dedicated radiation modelling. This creates bottlenecks limiting the feasibility and efficiency of this method. Our team at Queen Mary have designed new ways to overcome these computational weaknesses. For the first time, our high-performance algorithms can model systems and high-energy collisions to create realistic models of 'real-world' nuclear encapsulation materials...

Open Access for a Nuclear Future: Crucially, our software is making real-world impact because it is freely available for research groups around the world. The IAEA has praised the easily shareable nature of the modelling algorithms as an enabler of international progress on nuclear research. Armed with this invaluable new radiation modelling, organizations across the UK are making crucial advancements in the field of

nuclear storage and building more optimal solutions to enable nuclear power.

Queen Mary's research, and its impact on international policy, is enabling the international community to safely store some of the world's

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most dangerous materials. The benefits of this, from expedited radiation modelling to large-scale safety assessments, are advancing innovations in the storage of nuclear waste. As nuclear energy becomes an ever more significant step towards

our path to net-zero, we're paving the way for safer nuclear power.

Source: Kostya Trachenko, <https://www.qmul.ac.uk/media/news/2023/se/storing-the-most-dangerous-materials-on-earth-how-modelling-is-unlocking-the-potential-of-nuclear-power.html>, 15 November 2023.

Queen Mary's research, and its impact on international policy, is enabling the international community to safely store some of the world's most dangerous materials. The benefits of this, from expedited radiation modelling to large-scale safety assessments, are advancing innovations in the storage of nuclear waste. As nuclear energy becomes an ever more significant step towards our path to net-zero, we're paving the way for safer nuclear power.

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JAPAN

Japan Completes Third Round of Fukushima Treated Water Discharge

The third round of discharging treated radioactive water from the wrecked Fukushima No. 1

nuclear power plant into the sea concluded on 20 November 2023, the plant operator said, with the utility planning another round in the current fiscal year. As in the previous rounds, Tepco released about 7,800 metric tons of processed water about 1 kilometer off the coast via an underwater tunnel from November 2....

In four rounds of discharge, to be completed in the current fiscal year through March, Tepco plans to release about 31,200 metric tons of water

treated through an advanced liquid processing system that removes most of the radioactive substances except tritium. The total amount of tritium released into the sea is expected to be around 5 trillion becquerels, less than a quarter of the annual limit of 22 trillion becquerels.

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Tepco aims to dispose of 1.34 million metric tons of water collected in over 1,000 tanks at the power plant over the next three decades after diluting it with seawater to one-fortieth of the tritium concentration level permitted

under Japanese safety standards. Since the beginning of the discharge, Tepco said it has detected up to 22 becquerels of tritium per 1 liter of seawater in samples taken from areas near the outlet, far below the World Health Organization's limit of 10,000 becquerels for drinking water.

Source: <https://www.japantimes.co.jp/news/2023/11/20/japan/fukushima-radioactive-water-third-release/>, 20 November 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

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