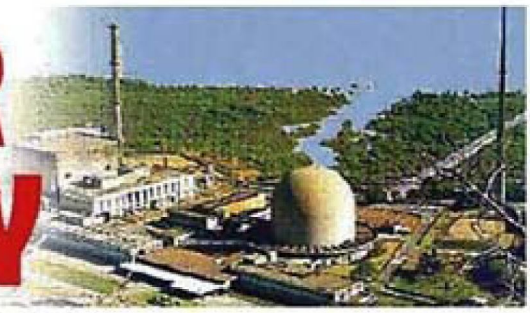
NUCLEAR SECURITY



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

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OPINION – Randy Breigle

Nuclear Power is a Staple of American Defense

For generations, the concept of nuclear power as a sustainable energy source has been unreasonably scrutinized and critiqued. Even though most scientists and experts have proven its sustainability and safety, groundless fear and governmental hesitance still envelop the nuclear power debate. With hefty climate goals put forth by the current administration, there remains no definitive route to achieve them, making it clear that the US needs to improve climate infrastructure, including nuclear technology. The hypocritical notion that reactor plants should close not only inhibits that improvement but directly imposes upon American defense.

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For generations, the concept of nuclear power as a sustainable energy source has been unreasonably scrutinized and critiqued. Even though most scientists and experts have proven its sustainability and safety, groundless fear and governmental hesitance still envelop the nuclear power debate. With hefty climate goals put forth by the current administration, there remains no definitive route to achieve them, making it clear that the US needs to improve climate infrastructure, including nuclear technology.

While many think of reactor technology as a recent invention, the US Navy begs to differ. With the concept of a marine vessel that would not have to make routine fuel stops, naval research on nuclear fission began in the early 1940s and propelled itself into service in 1955 with the commissioning of the USS Nautilus. As the first nuclear-powered underwater vessel, submarines were transformed from diesel-powered tubes with brief underwater stints to submersible warships capable of traveling for months on end, giving way to an endless array of possibilities for the Navy.

With 26 nuclear-powered submarines operating in 1962, and 30 more under construction at the time, the U.S. led the way in the nuclear sector. Nuclear surface vessels began to arise around the same time. The USS Enterprise was constructed in 1960 as the first nuclear aircraft carrier, and the USS Long Beach was completed in 1961 as the first vessel with two reactors aboard.

Consequently, maritime reactor technology became worldly profound to the point where it was being shared with Great Britain. While other countries such as China and Russia attempted to develop their own reactors upon naval vessels, the US is the only nation to have had no issues in development and follow-through.

To date, the U.S. Navy has had a flawless record of operation. Touted by the likes of late Sen. John McCain, nuclear power has demonstrated its worth through 134 million cumulative miles traveled and over 5,700 reactor-years of operation amassed. Meant to withstand the most capable attacks during wartime, these pressurized water reactors are built with the safety of the crew and all inhabitants of maritime vessels in mind. Safeguarded by damage control capabilities, crewmembers can live within close proximity to these power sources and maintain normal health with minimal risk. So why hasn't the civilian sector followed suit?

When taking a deeper look into the nuclear Navy, its policies are held to a stringent military standard alongside a training program that cultivates the country's next generation of nuclear operators. Built upon the principles of technical leadership, integrity and excellence, enlisted sailors acquire the knowledge to operate on nuclear reactors through a multi-tiered training pipeline where they must consistently demonstrate not just what to do in any given scenario, but an understanding of why elements within a reactor work the way they do. Coupled with a reactor structure fortified by welded protection, naval procedures allow for practically no radiation to be released, making nuclear power the most sustainable fuel source in comparison to alternatives.

With half of the remaining nuclear reactor plants scheduled to retire by 2030, there has been no policy intervention, jeopardizing the emissions goals that the country has put forth. In combating that narrative, the facts do not lie — nuclear power provides 52% of the US' clean energy, it is safe to the highest degree, and outdated nuances such as nuclear waste disposal are no longer cause for concern.

While nuclear power distinctly provides a demonstrated and effective means of energy that transcends all others, the threat of plant retirement remains imminent, seen most notably in Illinois and New York. With half of the remaining nuclear reactor plants scheduled to retire by 2030, there has been no policy intervention, jeopardizing the emissions goals that the country has put forth. In combating that narrative, the facts do not lie — nuclear power provides 52% of the US' clean energy, it is safe to the highest degree, and outdated nuances such as nuclear waste disposal are no longer cause for concern. Coupled with the fact that nuclear plants provide jobs to thousands of Americans per year, closing all of these plants would be devastating to the economy.

Additionally, the permitting process for a nuclear power plant takes approximately 80 months, with $60 million in permitting costs on average per the Nuclear Regulatory Commission. With a process as extensive as this, the ability of a nuclear power plant to get off the ground remains increasingly difficult, which is unfair given the clearly articulated benefits of nuclear power.

In order to keep nuclear power economically feasible in America, the long-winded regulation needs to be trimmed down. Studies show that regulations introduced in the 1970s caused construction costs of nuclear plants to skyrocket by 200%. Additionally, the permitting process for a nuclear power plant takes approximately 80 months, with $60 million in permitting costs on average per the Nuclear Regulatory Commission. With a process as extensive as this, the ability of a nuclear power plant to get off the ground remains increasingly difficult, which is unfair given the clearly articulated benefits of nuclear power.

In a political climate inundated with energy uncertainty, the U.S. Navy provides the country

with a glimpse of the fullest capabilities of clean energy. Traversing the globe, visiting foreign ports, and providing humanitarian relief, the Navy does some of the most influential work in the world — and it is fueled by nuclear power. If our government can ease some of the destructive barriers it has put up for commercial nuclear power, and allow the industry to operate like the Navy's nuclear program, the result would be job creation, a decrease in greenhouse gases, and more clean energy. It is pertinent for the safety of this country and the stability of the world that the rest of the U.S. set sail alongside the Navy and adopt nuclear power as a streamlined energy source.

Source: Randy Breigle is an enlisted member of the United States Navy and a member of the American Conservation Coalition. https://www.stripes.com/opinion/2023-07-03/nuclear-power-american-defense-10630432.html, 03 July 2023.

OPINION – Nicholas Saidel

Why the US Should Give Saudi Arabia Nuclear Technology

The US should assist Saudi Arabia in its quest for a civilian nuclear program in exchange for normalizing relations with Israel. The Biden administration is now engaged in an aggressive diplomatic push for a Saudi-Israel deal. One of Saudi Crown Prince Mohammed bin Salman's demands is that the US assist the Saudis in developing a civilian nuclear program. Acceding to this stipulation will prove difficult in terms of obtaining domestic and Israeli support. A Saudi nuclear program would create new risks in an already volatile region. Nonetheless, normalizing relations with Israel would reshape the landscape of the Middle East to America's benefit and is worth the price.

In March 2023, American influence in the Middle East suffered when China brokered a historic deal restoring relations between regional rivals Saudi Arabia and Iran. The deal was a setback for the U.S. as it elevated China's status as a Middle East power broker and allowed Iran—a state hostile to American interests—to emerge from isolation without a nuclear agreement. In the wake of the deal, other U.S. allies in the region, e.g., Egypt and the UAE, have repositioned their stance on Iran. The Biden administration should agree to the Saudi demand for civilian nuclear power to confront these new challenges and to reignite the momentum of the Abraham Accords.

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A U.S.-negotiated Saudi-Israel agreement would repair the anti-Iran alliance shaken up by the China deal. It would signal to Iran that overt measures are being taken to form a regional security architecture meant to counter Iranian meddling and adventurism—a concern shared by both Israel and Saudi Arabia. Formal integration of Israel into the region would strengthen U.S. deterrence and its hand in any new negotiations over Iran's nuclear program. It would also send a message to China and to Middle East states now looking eastward that the U.S. retains primacy as the main global power operating in the region.

Russia and China have both taken advantage of President Biden's mismanagement of Saudi relations, which soured during the first years of his term. Biden's rebuke of Saudi Arabia's military campaign in Yemen and his de-terrorist listing of the Houthis—an Iranian proxy militia that is fighting the Saudis in Yemen and that has also attacked Saudi Arabia proper—reduced Saudi confidence in American support. Biden's initial stance on the murder of journalist Jamal Khashoggi also added to the chilling of U.S.-Saudi relations. Saudi Arabia has since pivoted towards

U.S. competitors China and Russia. Collaborating with the Saudis to develop a civilian nuclear program would bring Saudi Arabia back into the American fold. The technical skill, resources, and infrastructure required for such a program would mean close American supervision for the foreseeable future, solidifying the U.S.-Saudi partnership.

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The Saudi economy poses challenges for the U.S. that would be largely resolved by weaning it from oil as its primary source of revenue. As laid out in its Vision 2030 plan, Saudi Arabia plans to transition from its oil-based economy, in part, by mining and enriching its ample uranium ore to become a "nuclear Aramco," able to export nuclear products and technology across the globe. Saudi Arabia is already cooperating with the IAEA to set up the legal framework for this shift. The Saudis are exploring China and Russia as alternatives if the U.S. is unwilling to assist. Saudi Arabia's oil-based economy allowed for close relations with Russia, also an oil exporting state. Saudi Arabia and Russia work in tandem to set global oil prices and optimize their revenue streams. Providing civilian nuclear technology to Saudi Arabia—a far cleaner and more sustainable source of energy than oil—would likely cause a rift in this Saudi-Russian partnership. American support for the Saudi nuclear initiative would also foreclose the possibility of China or Russia getting involved.

Saudi Arabia and Russia work in tandem to set global oil prices and optimize their revenue streams. Providing civilian nuclear technology to Saudi Arabia—a far cleaner and more sustainable source of energy than oil—would likely cause a rift in this Saudi-Russian partnership. American support for the Saudi nuclear initiative would also foreclose the possibility of China or Russia getting involved.

There are legitimate concerns that Saudi Arabia could militarize the program or start a Middle East nuclear arms race. As a member of the NPT, Saudi Arabia is legally bound never to pursue nuclear weapons. With Iran serving as precedent, the Saudis know any militarization efforts could lead to sanctions, isolation, and the threat of military attack on its nuclear sites. Having said that, the Saudis have stated they would seek a nuclear weapons capability should Iran acquire a nuclear bomb. This only underscores the need to forge a unified front to ensure Iran does not become a nuclear state.

Presently, Israel's acquiescence to such a deal is questionable. Israel is divided on the issue, with the security establishment being categorically opposed and the political echelon being more open to the idea. Any agreement should take Israel's security interests into account, perhaps by giving Israel access to the program and a monitoring role to confirm clear and actionable safeguards are enforced to prevent any negligent or malign activities.

Notwithstanding Israel's justified caution, the Jewish state and its leader, Benjamin Netanyahu, are in dire need of a political "win" given the Iran-Saudi rapprochement, the near pariah status Israel achieved by voting extremists into power, its illiberal proposals regarding its judiciary, and escalating conflict with the Palestinians. Israel would also be wise to take note: Should a normalization agreement with the Saudis take place with the focal point being a Saudi nuclear program, the result would be less pressure on Israel with respect to the Palestinian issue. The Saudis previously stated that a Palestinian state is a prerequisite to normalization. Israel should take advantage of this drastic policy shift.

There is a good chance Congress would shoot

down any agreement whereby Saudi Arabia *enriches uranium on its own soil*—the Saudi demand as it now stands. Assuming domestic enrichment is a red line for the Saudis, this obstacle may be the biggest challenge to a deal, but it is not insurmountable. Obtaining congressional approval will require coordinated efforts by pro-Israel and pro-Saudi lobbyists, and deft diplomacy on the part of the Biden administration. Identifying and reaching out to leading members of Congress on both sides of the aisle who may support this initiative, such as Lindsey Graham (R-SC), Mitch McConnell (R-KY), and Bob Menendez (D-NJ), would be instrumental in forming a bipartisan coalition around which the president can rally further support. To attract members of Congress, the Biden administration should leverage the steep nuclear demand to obtain Saudi concessions on human rights reform.

A U.S.-brokered normalization agreement between Israel and Saudi Arabia whereby Saudi Arabia acquires civilian nuclear technology would serve the American national interest even though it presents myriad risks. It will bring Saudi Arabia—the epicenter of the Arab and Islamic world—squarely back into America's sphere of influence to the detriment of both China and Russia. It will enhance the regional security architecture meant to isolate, deter, and prevent Iranian aggression.

A U.S.-brokered normalization agreement between Israel and Saudi Arabia whereby Saudi Arabia acquires civilian nuclear technology would serve the American national interest even though it presents myriad risks. It will bring Saudi Arabia—the epicenter of the Arab and Islamic world—squarely back into America's sphere of influence to the detriment of both China and Russia. It will enhance the regional security architecture meant to isolate, deter, and prevent Iranian aggression. An agreement would also strengthen the U.S. hand in any Iranian nuclear negotiations. Finally, such an agreement would further the goals of the Abraham Accords and pave the way for more normalization agreements that will help stabilize and bring relative calm to the Middle East.

Source: https://www.newsweek. com/why-us-should-give-saudi-arabia-nuclear-technology-opinion-1811420#:~:text=Collaborating%20 with%20 the%20Saudis%20to, solidifying%20 the%20U.S.% 2DSaudi%20partnership, 07 July 2023.

OPINION – Lily Moll, John Bratton

Tennessee is Leading the Way in Nuclear Energy Development

Tennessee just took another step towards clean, reliable energy for its citizens./ Gov. Bill Lee signed an executive order in May establishing the Tennessee Nuclear Energy Advisory Council, a board of legislators and industry experts that will focus on removing barriers and finding opportunities for nuclear energy development in the state. This comes on the heels of Gov. Lee's State of the State Address where he proposed a "Nuclear Fast Track" fund of $50 million to incentivize nuclear development and job growth in Tennessee. These two steps are massive strides in securing Tennessee's energy independence and sustainability in the coming decades.

Long viewed as the "boogeyman" of energy sources, nuclear energy has proven to be one of the safest and cleanest sources we have available, with lower greenhouse gas emissions and deaths by either accident or air pollution compared to nearly all other energy sources. Nuclear energy's efficiency is similarly unmatched, with a standard plant producing nearly double the power of your average coal plant and over three times that of a solar or wind plant.

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compared to nearly all other energy sources. Nuclear energy's efficiency is similarly unmatched, with a standard plant producing nearly double the power of your average coal plant and over three times that of a solar or wind plant. While renewable energy has the distinct advantage of not requiring a finite fuel source, our governor put it best, stating that, "there is no long-term national strategy that doesn't include nuclear energy."

The Nuclear Energy Advisory Council and Nuclear Fast Track fund are part of Tennessee's continuing strategy to secure safe, reliable energy for all its citizens. Since the early 1980s, the Sequoyah Nuclear Plant has been safely humming along, providing power to over a million homes each day for decades. When combined with its sister plant at Watts Bar, nuclear energy covers over 40% of the state's energy generation. With further expansion of nuclear energy in the state, utilizing emerging technologies such as SMRs along with maintenance and renovation of our existing plants, more of our grid can move away from fossil fuels and toward a source that secures our independence and prosperity while protecting our health and natural resources.

Nuclear energy is not only good for the grid, but it also is important for workforce development. The US nuclear industry affects almost 150,000 careers, and each nuclear reactor employs 500 to 800 workers. The nuclear energy industry expands beyond your typical engineer; it relies on skilled trade workers, professionals like lawyers and accountants, and scientists working in the field. By expanding the nuclear energy industry in Tennessee, we have the opportunity to create hundreds of much-needed jobs in rural communities.

This nuclear expansion comes at the perfect time in Tennessee. We have learned that the development of Tennessee's future workforce is critical to its success. With the announcement of Ford's Blue Oval City, an electric vehicle plant outside Memphis, millions of dollars are being poured into technical education throughout the state. These reinvented technical education programs are largely focused on advanced energy careers, which include nuclear technologies. We have a unique opportunity to deploy our workforce in such careers.

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Tennessee has been leading the nation in economic growth, business development, personal liberty and so much more. With the development of the advisory council, we are shifting toward clean energy in a way where the environment and the economy can grow hand in hand, protecting both people and the planet. Under Gov. Lee's leadership, we can say we are leading the nation in nuclear energy expansion, and that is something to be proud of. Lee is the conservation governor we all need.

Source: https://www.tennessean.com/story/opinion/contributors/2023/06/30/opinion-tennessee-is-leading-the-way-in-nuclear-energy-development/70359176007/, 30 June 2023.

OPINION – Alicia Anders-Zakre

Now is the Time for Saudi Arabia to Join the Nuclear Ban Treaty

While it is not currently suspected to be developing nuclear weapons, Saudi Arabia is considered a proliferation risk due to its rhetoric about nuclear development, uranium stockpiles, and lack of international nuclear inspections. The government said it plans to develop its own uranium enrichment capability using domestically mined ore to fuel nuclear power stations, which has raised concerns it could use this as the basis

for a weapons program.

Saudi Arabia acquiring nuclear weapons would be dangerous and illegal. Saudi Arabia can and should take technical steps to mitigate this risk, including increasing access for international nuclear inspectors. But to put definitively to rest any doubts about its nuclear intentions, Saudi Arabia should join the Treaty on the Prohibition of Nuclear Weapons (TPNW) without delay, thereby forswearing all nuclear weapons activities, including development, use, and threat of use. With the risk that nuclear weapons could be used at an all-time high, following Russia's threats to use nuclear weapons in Ukraine and the escalation of nuclear tensions on the Korean peninsula, all efforts must be made to prevent further proliferation, which only increases the risk of nuclear use.

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Nuclear weapons have uniquely horrific effects. They are weapons of mass destruction that kill innocent civilians on a mass scale, burning bodies, leaving eyeballs hanging from their sockets, and scarring descendants of survivors for generations with radiation-caused diseases and psychological trauma. A 300 kiloton nuclear weapon (a common-sized nuclear weapon across arsenals) dropped on Riyadh would kill nearly 500,000 people immediately people immediately, instantly injuring nearly a quarter of a million more men, women and children, including causing third degree burns for everyone within 6.3km of the blast's hypocenter. There is no adequate health care response for such a tragedy, as medical professionals have warned repeatedly in the advocacy for nuclear abolition.

While Saudi Arabia, like other nuclear-armed states, would try to assure the international community that its nuclear weapons are only intended for "deterrence," and meant to keep the peace, the Russian invasion of Ukraine has demonstrated all too clearly the problems with deterrence theory. This strategic theory is based on the flawed premise that leaders of nuclear-armed nations will always act rationally and in their states' best interest, clearly communicating their intentions so their adversaries may respond accordingly. It ignores the possibility of human error, of miscalculations, or misunderstandings that have always existed and brought us to the brink of nuclear war in the past, but which are now even more likely with the increased use of artificial intelligence. Regardless of what excuses Saudi Arabia may employ, the simple fact is that nuclear weapons are prohibited under international law. Saudi Arabia is party to the 1968 NPT, which bans its adherents from acquiring nuclear weapons. However, while it participated in the negotiations, Riyadh has not yet joined the 2017 Treaty on the Prohibition of Nuclear Weapons.

Regardless of what excuses Saudi Arabia may employ, the simple fact is that nuclear weapons are prohibited under international law. Saudi Arabia is party to the 1968 NPT, which bans its adherents from acquiring nuclear weapons. However, while it participated in the negotiations, Riyadh has not yet joined the 2017 Treaty on the Prohibition of Nuclear Weapons.

The TPNW is the only treaty to comprehensively ban all nuclear weapons activities, providing a pathway for their verifiable elimination, as well as instituting an international structure to assist victims of nuclear weapons use and testing, and clean up contaminated environments. It was adopted by 122 countries at the United Nations in

2017, took full legal force in 2021, and held its first major meeting in 2022, where a 50 point action plan to advance toward disarmament was adopted. Actions so far include creating a working group dedicated to nuclear disarmament verification and the establishment of an international scientific advisory group, composed of 15 leading scientific experts to advise states parties on implementation of the treaty and conduct new research.

If it were to join this landmark treaty, Riyadh could adopt stronger international safeguards, as other TPNW members have done, such as Cabo Verde, Guinea Bissau, and Sierra Leone, putting concerns to rest in the region and beyond that it could be clandestinely pursuing nuclear weapons. The first step to achieving this is for Saudi Arabia to join the TPNW at the earliest opportunity.

Source: https://www.newsweek. com/now-time-saudi-arabia-join-nuclear-ban-treaty-opinion-1811402, 07 July 2023.

OPINION – *Las Vegas Review-Journal*

Sweden Embraces Nuclear Energy

Sweden has figured out a way to produce reliable energy without fossil fuels. It's looking to build new nuclear power plants. The EU has been extremely aggressive in pushing to reduce carbon emissions. By 2030, it wants to reduce emissions by 55 percent compared with 1990 levels. Then, it wants to achieve net-zero emissions by 2050. Not surprisingly, this hasn't gone well. Some countries worry about job losses from eliminating gas-powered cars. Prices on things from food to air travel are likely to increase, perhaps dramatically. The cost pressure is contributing to a destabilization in European politics.

The most obvious failure came after Russia invaded Ukraine. Instead of developing their internal energy resources, countries such as Germany became dependent on Russian natural gas. When the war disrupted that arrangement, it triggered an energy crisis in Europe. Things got so bad that Germany restarted or extended the life of at least 20 coal plants. So much for reducing carbon emissions. Sweden is taking a different approach. It recently changed its energy production policy from "100 percent renewable" power to "100 percent fossil-free." Around four decades ago, it voted to move away from nuclear energy. This vote signifies a reversal of that policy. "This creates the conditions for nuclear power," Finance Minister Elisabeth Svantesson said. "We need more electricity production, we need clean electricity, and we need a stable energy system."

Sweden is taking a different approach. It recently changed its energy production policy from "100 percent renewable" power to "100 percent fossil-free." Around four decades ago, it voted to move away from nuclear energy. This vote signifies a reversal of that policy. "This creates the conditions for nuclear power," Finance Minister Elisabeth Svantesson said. "We need more electricity production, we need clean electricity, and we need a stable energy system.

Within 20 years, demand for electricity is expected to double. New nuclear plants can accommodate that growth while not producing carbon emissions. Not that it matters much. In 2021, China produced almost 50 percent more carbon emissions than the EU and US combined. But at least this plan puts Sweden on course to have a reliable power system. Nuclear energy is an admittedly a severely damaged brand. But it's also decades-old technology that's a foundational part of U.S. and world power generation. In 2022, more power in the US came from nuclear energy than wind and solar — combined. And that's after decades of expensive subsidies and mandates. It's widely used by some European countries, too. Around 70 percent of France's power comes from nuclear plants.

"Living close to Russia focuses the mind, and the Swedish people not only wish to join NATO, but also to ground their economy in an energy source, nuclear, that is physically sound and secure, unlike renewables which are neither," said John Constable, an energy expert with British Net Zero Watch. This is a wise and prudent approach. If progressives

want to reduce carbon emissions rather than cripple our domestic energy production, they should urge the US to follow Sweden's example.

Source: https://www.reviewjournal.com/opinion/editorials/editorial-sweden-embraces-nuclear-energy-2805489/, 07 July 2023.

OPINION – *Kyiv Post*

Why Russia's F-16 'Nuclear' Threat Claim Is Absolute Nonsense

In the latest installment of saber-rattling, the Kremlin has insisted that Russia will regard Western F-16 fighter jets sent to Ukraine as a "nuclear" threat because of their capacity to carry atomic weapons.

Lavrov was quoted as saying by the Russian foreign ministry. "In the course of combat operations, our servicemen are not going to sort out whether each particular aircraft of this type is equipped to deliver nuclear weapons or not. "We will regard the very fact that the Ukrainian armed forces have such systems as a threat from the West in the nuclear sphere.

Speaking on July 13, Foreign Minister Sergei Lavrov was responding to an announcement made at yesterday's (12 July) NATO summit that the Netherlands and Denmark are leading a plan to train Ukrainian pilots on using the US-made aircraft as part of an 11-nation coalition beginning in August. "Russia cannot ignore the ability of these aircraft to carry nuclear weapons. No amount of assurances will help here," Lavrov was quoted as saying by the Russian foreign ministry. "In the course of combat operations, our servicemen are not going to sort out whether each particular aircraft of this type is equipped to deliver nuclear weapons or not. "We will regard the very fact that the Ukrainian armed forces have such systems as a threat from the West in the nuclear sphere."

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So is Lavrov correct and Ukrainian F-16s pose a specific nuclear threat to Russia? In short, any aircraft including the ones Ukraine already uses could be equipped with nuclear weapons so the F-16s pose no additional risk to Russia. Furthermore, there are quite a few other things that would have to happen in order for them to be as deadly as Lavrov is trying to make out. Over to Kyiv Post's resident aircraft expert, former F-16 pilot and now-editor, Christopher Stewart:

Any aircraft is actually nuclear weapons capable. A blimp, dirigible, zeppelin or hot air balloon is nuclear weapons capable. The question is whether a controlled nuclear weapon can be employed based on using a special weapon where the device is manufactured with specific requirements to arm the warhead. The casual usage of the phrase usually refers to being capable of delivering nuclear weapons with a lot of safety and security-based armament procedures. This implies that the device is one that has such safeguards designed into it so it cannot be used without permission.

The "secret nuclear codes" are called PAL and require certain inputs to be given to the weapon before the warhead can be armed. It's not just a switch to be flipped and a button to be pressed. In fact, without PAL you can drop a nuclear weapon, it just will not function. This, again, presumes that the nuclear weapon has such safeguards built in, usually because the government procuring and controlling the weapon was a signatory party to international treaties. If a rogue country makes a weapon and doesn't build in special safeguards, it is nuclear capable.

Case Study: The B61: The nuclear weapon most commonly available for US fighter aircraft use is the B61. With a yield from 0.3 kt (equivalent

kilotons of TNT) to 340 kt weapon could be carried by the F-15E, F-16, F/A-18, F/A-22, F-35, AV-8B. Retired aircraft that could carry the B61 included the A-4, A-6, F-4, F-100, F-105 and F-111 (and likely the F-117, unconfirmed). Of course, the US bomber fleet of B-52s, B-1s and B-2s, and the new B-21 all have the capability to use the B61 along with much larger yield nuclear weapons such as the B83. These are the only aircraft deliverable nuclear bombs currently in the US inventory.

Other NATO countries involved in the nuclear sharing program, in which the US keeps control of the PAL codes, include Belgium, Germany, Italy, the Netherlands and Turkey. For example, NATO aircraft that can use the B61 include Germany's Tornado IDS and Berlin plans to supplant or replace the older aircraft with its purchase of F-35s.

The United Kingdom and France have their own nuclear weapons programs, though the UK has been part of a nuclear sharing program in the past. Other NATO countries involved in the nuclear sharing program, in which the US keeps control of the PAL codes, include Belgium, Germany, Italy, the Netherlands and Turkey. For example, NATO aircraft that can use the B61 include Germany's Tornado IDS and Berlin plans to supplant or replace the older aircraft with its purchase of F-35s. So there you have it – more saber-rattling and little actual sense from the Kremlin.

Belarusian President Lukashenko, the Kremlin's staunchest ally in its war in Ukraine, said on Friday he was certain Russian tactical nuclear weapons deployed in his country would never be used. Lukashenko and Russian President Putin have acknowledged that some tactical weapons have arrived in Belarus and the remainder would be put in place by the end of the year.

Source: https://www. kyivpost.com/post/19404, 13 July 2023.

NUCLEAR STRATEGY

BELARUS–RUSSIA

Putin Ally Belarusian Leader Says Nuclear Weapons Won't be Used in Ukraine War

Belarusian President Lukashenko, the Kremlin's staunchest ally in its war in Ukraine, said on Friday he was certain Russian tactical nuclear weapons deployed in his country would never be used. Lukashenko and Russian President Putin have acknowledged that some tactical weapons have arrived in Belarus and the remainder would be put in place by the end of the year.

The Belarusian president, in an address marking his ex-Soviet state's national day, said the stationing of the weapons in Belarus was "my firmest initiative". "As we move along, we become more and more convinced that they (the weapons) must be stationed here, in Belarus, in a reliable place," Lukashenko told a gathering in a large hall in an online broadcast by the state BelTA news agency, with many present waving red and green national flags. "I am certain that we will never have to use them while they are here. And no enemy will ever set foot on our land." Lukashenko, like Russia, has repeatedly accused Western countries of trying to destroy his state and says nuclear deployment is necessary to deter potential aggressors. He said this month that some arms were in Belarus and at one point suggested he would not hesitate to use them if necessary, while adding that consultations with Russia would be needed.

Russia's Deputy Foreign Minister Ryabkov said the deployment did not violate the NPT of 1968 as Russia retained control over the weapons. He told Russia's Tass news agency the deployment had been "forced" on Russia. Lukashenko allowed Putin to launch part of the February 2022 invasion of Ukraine from Belarus and has supported the war —brokering a deal last week to enable mercenary chief Yevgeny Prigozhin and his fighters to move operations to his country.

The head of neighbouring Poland's National Bureau of Security, Jacek Siewiera, said Wagner fighters relocating to Belarus could use migrants

from Africa and other countries to destabilise central and eastern Europe. Siewiera's comments to the *Financial Times* were a reference to clashes on the Belarusian border in 2021 when migrants tried to push their way into Poland, which accused Lukashenko of encouraging them to come to the country. ...

Source: https://www. indiatoday.in/world/story/putin-ally-belarusian-leader-says-nuclear-weapons-wont-be-used-in-ukraine-war-2400402-2023-07-01, 01 July 2023.

NORTH KOREA

Kim Jong Un Vows to Boost North Korea's Nuclear Capability after Observing New Long-Range Missile Launch

North Korean leader Kim Jong Un vowed to further bolster his country's nuclear fighting capabilities as he supervised the second test flight of a new, powerful intercontinental ballistic missile designed to strike the mainland United States, state media reported. Kim's statement suggested North Korea would ramp up weapons testing activities to expand its arsenal in response to recent US steps to enhance its security commitment to ally South Korea. "(Kim) clarified again that there will be no change and vacillation in the strategic line and policy of (the North Korean) government to steadily accelerate the development of more developed, effective and reliable weapon system," the Korean Central News Agency said.

Kim's statement suggested North Korea would ramp up weapons testing activities to expand its arsenal in response to recent US steps to enhance its security commitment to ally South Korea. "(Kim) clarified again that there will be no change and vacillation in the strategic line and policy of (the North Korean) government to steadily accelerate the development of more developed, effective and reliable weapon system," the Korean Central News Agency said.

Kim said North Korea is compelled to bolster the country's "nuclear war deterrent" because the security environment on the Korean Peninsula "is being seriously threatened by the hostile forces every moment." The Korean Central News Agency reported Kim's comments a day after the launch of the Hwasong-18, which was first test-fired in April and which Kim has called the most powerful weapon of his nuclear forces.

The road-mobile ICBM has built-in solid propellant, which makes it more difficult to detect in advance than liquid-fuelled missiles. KCNA said the launch was meant to reconfirm the technical credibility and operational reliability of the missile. Kim called the launch "another important stride" in efforts to boost the North's strategic forces, KCNA said. According to KCNA, the missile was launched at a high angle to avoid neighbouring countries. It flew 74 minutes and a distance of 1,001 kilometres at a maximum altitude of 6,648 kilometres before landing in a targeted area in the open waters off the North's east coast.

The missile's flight time is the longest recorded by any weapon launched by North Korea. If launched on a standard trajectory, the missile could fly to the mainland US, though some experts say North Korea still has some technologies to master to acquire functioning nuclear-armed missiles. South Korea, Japan and the United States criticised North Korea over the launch that they said posed a threat to regional and international peace. Adam Hodge, a spokesperson for the US National Security Council, said in a statement that the US will take all necessary steps to ensure the security of the American homeland and South Korean and Japanese allies.

The UNSC scheduled an open meeting late Friday afternoon (14 July) to discuss the ICBM launch at the request of the United States, Albania, France, Japan, Malta and the United Kingdom. Wednesday's (13 July) launch violated UN Security Council resolutions that ban any North Korean launches using ballistic technologies. But it's unclear if the council can impose new sanctions on North Korea because China and Russia, both veto-wielding permanent members, had blocked the US and others' previous attempts to do so over North Korea's other recent ballistic launches.

South Korea's military said it maintained a firm readiness to repel potential provocations by North Korea and was pushing to achieve "peace through strength," based on the strong military alliance

with the United States. Joint Chiefs of Staff spokesperson, Lee Sung Joon, said the South Korean and US authorities agreed to maintain a solid joint defense posture after the North Korean launch.

Kim said North Korea will take "a series of stronger military offensive" until the US and South Korea "admit their shameful defeat of their useless hostile policy toward (North Korea) in despair and give up their policy." That signals Kim will intensify his push to modernise his missile arsenals with sophisticated weapons like the Hwasong-18. Other weapons on Kim's publicly stated wish list are a multi-warhead missile, a hypersonic weapon, a spy satellite and a nuclear-powered submarine.

North Korea has been focusing on reinforcing its nuclear capability after Kim's high-stakes nuclear diplomacy with then-President Donald Trump collapsed in 2019 due to disputes over US-led sanctions on North Korea. KCNA accused the US and South Korea of recently taking "frantic confrontation attempts" and bringing "a new chain of nuclear crises" to the Korean Peninsula. North Korea often issues such harsh, warlike rhetoric in times of tension with its rivals. The KCNA dispatch cited a US-South Korean agreement to strengthen the allies' deterrence capabilities such as the periodic docking of a US nuclear-armed submarine in South Korea and the establishment of a new bilateral nuclear consultative group, whose inaugural meeting is slated for next week in Seoul.

The United States has expanded military drills with South Korea and taken steps to enhance "regular visibility" of US strategic assets to the Korean Peninsula in response to the North's advancing nuclear arsenal. North Korea conducted about 100 missile tests since the start of 2022. Experts say Kim eventually aims to use his enlarged arsenal to win greater concessions in future diplomacy with the United States.

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Source: https://indianexpress.com/article/world/kim-vows-korea-nuclear-capability-missile-launch-8833637/, 13 July 2023.

POLAND

Poland Hopes to Join NATO's Nuclear Weapon Sharing Program

Polish PM Morawiecki says his country is seeking to join NATO's nuclear weapon sharing program in response to Russia's deployment of strategic nuclear weapons to neighboring Belarus. Russian President Putin last month said his country will deploy nuclear weapons in Belarus. A Belarusian state-run news agency quoted the country's president Lukashenko as saying on Tuesday (27 June) that most of the weapons had arrived. Morawiecki told reporters in Belgium that his country does not want to sit idly by while Putin escalates its threats. Under the NATO program, US nuclear weapons are deployed in five member states, including Germany, for joint use in case of an emergency. Morawiecki said, "The final decision will depend on our American and NATO partners. We declare our will to act quickly in this matter."

Source: https://www3.nhk.or.jp/nhkworld/en/news/20230701_21/, 01 July 2023.

BALLISTIC MISSILE DEFENCE

POLAND

Polish Missile Defence Site to be Developed by End of 2023: Report

Nancy Jones-Bonbrest, who is spokeswoman for the Pentagon's Missile Defense Agency (MDA),

said the Aegis Ashore Poland site would be completed and ready for acceptance tests by the US Navy by the end of 2023, Polish state news agency PAP reported on Wednesday (5 July). After completion, the site at Redzikowo in northern Poland will become America's second such missile defence site in Europe, Jones-Bonbrest said, according to the PAP news agency. Jones-Bobrest was also quoted as saying that the launch of the Redzikowo site would mark the completion of the 2009 US ballistic missile defence strategy for Europe, the European Phased Adaptive Approach (EPAA). A US contribution to NATO's missile defence system, the EPAA is designed to protect Europe against short-, medium-, and intermediate-range ballistic missiles launched from Iran, according to the US-based Arms Control Association.

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In addition to the site in northern Poland, the EPAA comprises an Aegis Ashore site at Deveselu Air Base in Romania, a THAAD radar at Kürecik, Turkey, and a command centre at Ramstein Air Base in Germany, the PAP news agency reported. Moreover, BMD-capable US Navy Aegis ships are stationed at a naval base in Rota, Spain, according to officials. A final part of the system, the Aegis Ashore Poland site at Redzikowo will host an AN/SPY-1 radar, Mk 41 VLS launchers and anti-ballistic SM-3 (Standard Missile-3) rockets, the PAP news agency reported. Riki Ellison, founder and chairman of the Missile Defense Advocacy Alliance, an American NGO, said the Aegis Ashore system would deter a "limited first strike" by an enemy, protecting Polish citizens and the country's critical infrastructure, according to PAP.

SMART-L is a series of L-band (NATO D-band) (1–2 GHz) 3D active electronically scanned array (AESA) radars designed for air and surface surveillance as well as target designation. The systems are available in a land (MM/F), deployable (MM/D), and naval (MM/N) variants and have an instrumented range of up to 2,000 km.

Source: https://www.polskieradio.pl/395/7784/artykul/3202612,polish-missile-defence-site-to-be-developed-by-end-of-2023-report, 05 July 2023.

SWEDEN

Sweden Orders New Ground-based Radars from Thales

Sweden has acquired new long-range radars from Thales to bolster its air surveillance and ballistic missile defence capabilities. The contract, signed with the Swedish Defence Materiel Administration (FMV), is for the company's SMART-L Multi Mission Fixed (MM/F) land-based long-range radar. A Thales spokesperson informed *Janes* that the radars would be delivered between 2025 and 2028, although they were unable to comment on the number of units being procured. SMART-L is a series of L-band (NATO D-band) (1–2 GHz) 3D active electronically scanned array (AESA) radars designed for air and surface surveillance as well as target designation. The systems are available in a land (MM/F), deployable (MM/D), and naval (MM/N) variants and have an instrumented range of up to 2,000 km. This allows the systems to detect a wide range of aerial threats, including low-observable aircraft and ballistic missiles. In addition, the radars have the capability to observe and detect objects in space.

Source: https://www.janes.com/defence-news/news-detail/sweden-orders-new-ground-based-radars-from-thales, 06 July 2023.

USA

US Navy Receives First of the Flight III DDGs

Ingalls Shipbuilding, a division of US naval prime Huntington Ingalls Industries (HII), has delivered the first Flight III *Arleigh Burke*-class guided missile destroyer, *Jack H. Lucas* (DDG 125),

to the US Navy, a key landmark in the ongoing development of the class. The *Jack H. Lucas* (DDG 125) is the first Flight III *Arleigh Burke*-class destroyer being built for the US Navy by Ingalls and incorporates a number of design modifications to earlier models. The Flight III configured destroyers include the AN/SPY-6(V)1 air and missile defence radar (AMDR), the Aegis Baseline 10 combat system, and upgrades to the electric power and cooling capacity. In a 27 June release, HII stated that the company had delivered 35 destroyers to the US Navy including DDG 125, with four Flight IIIs currently under construction including the future USS *Ted Stevens* (DDG 128), which is scheduled to be christened in August. Additionally, *Jeremiah Denton* (DDG 129), *George M. Neal* (DDG 131) and *Sam Nunn* (DDG 133) are under construction.

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Delivery of DDG 125 represents the official transfer of the ship from the shipbuilder to the Navy. In May, the US Navy revealed the future USS *Jack H. Lucas* (DDG 125) had completed acceptance trials, which saw the vessel and crew perform demonstrations for review by the service's Board of Inspection and Survey (INSURV). The demonstrations were used by INSURV to validate naval specifications and requirements prior to delivery of the ship to the US Navy.

What is the Flight III? The *Arleigh Burke*-class DDG series first entered service with the US Navy in 1991, and has since been upgraded to the Flight II, Flight IIA, and now Flight III iterations. According to the US Navy, DDGs 51-71 represent the original design and are designated as Flight I; DDGs 72-78 are Flight II ships; and DDGs 79-124 and DDG 127 are Flight IIA ships. The Flight III baseline begins with DDGs 125-126 and continues with DDG 128 and subsequent vessels.

Replacing the legacy *Charles F. Adams* class (DDG 2), the DDG 51 series was designed with an all-new hull form, incorporating much of the *Spruance* class (DD 963) propulsion and machinery plant, and the integrated Aegis Weapons System (AWS) from the *Kidd*-class (DD 993) destroyers and installed on the larger, and still in service, *Ticonderoga*-class cruisers. The AWS is composed of a multi-function phased array radar, anti-air warfare (AAW) and anti-submarine warfare (ASW) systems, vertical launch missiles, and the Tomahawk cruise missile weapon system. The latest Flight III, with the AMDR, enables the class to simultaneously perform AAW and ballistic missile defence capabilities.

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Source: https://www.naval-technology.com/news/us-navy-receives-first-flight-iii-ddg/, 28 June 2023.

US to Dispatch Ballistic Missile Submarine to South Korea

As part of its military build-up throughout the Indo-Pacific, the US is planning to dispatch an Ohio-class SSBN to South Korea, the largest in its fleet, for the first time in more than four decades. The exact date of the submarine's arrival has not been released, but is expected around July 27, the anniversary of the end of the Korean War. Washington and Seoul have dressed up the submarine's visit and their increasing military cooperation as a defensive response to the supposed North Korean "threat." The deputy commander of US Forces Korea, Lieutenant General Scott Pleus, stated, "In the near future, you can expect another show of the US

commitment to extended deterrence by a port visit by the nuclear-powered ballistic missile submarine."

US President Biden and his South Korean counterpart President Yoon agreed to the dispatching of the nuclear-armed submarine and other strategic assets during the pair's summit in Washington in April, in what was dubbed the "Washington Declaration." The two also agreed to deepen their collaboration over US nuclear weapons through the formation of a Nuclear Consultative Group (NCG). The NCG will allow Seoul to coordinate more closely with Washington in planning and training for the use of US nuclear weapons, meaning that the visit by a submarine capable of launching nuclear weapons is not just a port call, but an aspect of Seoul's participation in planning for nuclear war.

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This nuclear collaboration is not aimed at North Korea, an impoverished country of 26 million people. It is, above all, part of the preparations for a US-instigated war against China to which the Yoon administration has signed up for behind the backs of the South Korean working class. In this regard, Pleus also stated, "As our alliance continues to expand, we will keep building upon our commitments not only to the security of Northeast Asia, but also to a free and open Indo-Pacific and a free and open global commons." ...

The upcoming submarine visit follows a similar dispatch of the USS Michigan, an Ohio-class guided missile submarine (SSGN), in June. Rather than ballistic missiles, this vessel fires Tomahawk cruise missiles which can carry conventional or nuclear warheads. The USS Michigan left South Korea on June 22 following combined drills with the South Korean navy. Other drills carried out by the two allies include combined air drills over the Korean Peninsula last Friday involving at least one US B-52 strategic bomber. The drills also included South Korean F-35A and KF-16 fighter jets as well as F-16 and F-15E US fighters.

...The US is planning the full rollout of its THAAD battery in South Korea. THAAD was first installed in 2017, shortly before Moon Jae-in, of the now main opposition Democratic Party of Korea (DP), took office as president. Falsely posturing as an opponent of war even as he oversaw THAAD's deployment, Moon called for an environmental risk assessment rather than take actual steps to stop the installation. With the risk assessment now concluded, the way has been cleared for the battery's full deployment. The battery includes the AN/TPY-2 radar system, which is capable of spying deep into China, leading Beijing to call the battery a security threat. Washington claims it is necessary to protect South Korea from a supposed North Korean attack. In reality, THAAD, which does not even cover Seoul from its current location in Seongju County, is meant to protect US bases as Washington turns South Korea into the frontline of a war with China. ...

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Source: https://www.wsws.org/en/articles/2023/07/04/mkjv-j04.html, 03 July 2023.

EMERGING TECHNOLOGIES AND DETERRENCE

UK

Labour Seeks Pact to Keep AI Out of Nuclear Arms Deployment

A Labour government could negotiate a pact with other countries to jointly ban the use of AI in decisions about deploying nuclear weapons, *The Telegraph* can reveal. ... the UK needs to agree rules with other nations, including China, to regulate the use of AI in relation to nuclear arms. The rapid advancement of AI in the last year has left governments scrambling to catch up with how the technology can be safely controlled. Fears have been raised about whether AI could be introduced into the decision-making process about when to deploy nuclear weapons. Nations could decide to automate elements of their nuclear command and control in a bid to enhance deterrence by making sure that a counter-strike is certain to take place if they are subject to a nuclear attack.

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Last week, Dame Barbara Woodward, the UK's ambassador to the United Nations, highlighted this as an area of concern as she announced that the UNSC would discuss AI for the first time later this month. She said: "There have to be concerns about how AI might be used, for example in nuclear technology – whether any country with nuclear weapons would consider handing over the management of those weapons to AI and how that could go wrong – and the same with automated weapons as well."

...Lord Hague, the former foreign secretary, has previously said that it should be possible to reach an agreement with China about not delegating control of nuclear weapons to AI. "There are things that countries ought to be able to agree, for instance, that AI will never be allowed near nuclear weapons or...dangerous pathogens," he said earlier this year. "This needs ethically, politically, nailing down now, that you never allow it anywhere near these things, because these are the most likely routes to destroy the whole of humanity."

Governments are already making the tentative first step towards international regulation of AI. Last month, the *Telegraph* revealed that Rishi Sunak would host a global summit in London later this year, aimed at devising international rules on AI. It followed a warning by the leaders of the world's most advanced AI laboratories – OpenAI, Google Deepmind and Anthropic – that "mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war." At a meeting in Downing Street with the three bosses in May, Mr Sunak discussed the risk of the technology, "ranging from disinformation and national security, to existential threats".

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Source: https://www.msn.com/en-us/news/world/labour-seeks-pact-to-keep-ai-out-of-nuclear-arms-deployment/ar-AA1dBL9n, 08 July 2023.

UK Launching £1bn Framework to Boost Hypersonic Strike Capability

The MoD has issued a Prior Information Notice designed to accelerate the development of the UK's Hypersonic Strike Capability. A Prior Information Notice, better known as a PIN, serves as a preliminary indication to suppliers regarding potential future procurement activities. *As part of Team Hypersonics (UK)'s overall delivery strategy, it is the intention of the Defence Equipment & Support (DE&S) to establish a multi-supplier Hypersonic Technologies & Capability Development Framework Agreement.* The primary aim of the Framework will be to accelerate development of the UK Hypersonic Strike Capability. *The Framework is to provide a route to market up to Technology Readiness Level (TRL) 9 and to deliver future operational elements of a Hypersonic Strike capability, this will be a collaborative enterprise approach* to accelerate the Ministry of Defence's (MoD's) acquisition of an advanced Hypersonic Strike capability.

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A PIN like this is designed to drum up interest and potentially mould the tender based on feedback from potential suppliers. Part of Team Hypersonics (UK)'s overarching delivery strategy, this PIN seeks to establish a multi-supplier agreement. As stated in the notice, *"It is the intention of the Defence Equipment & Support (DE&S) to establish a multi-supplier Hypersonic Technologies & Capability Development Framework Agreement."*

The purpose is to create a route to market, delivering the operational elements of a Hypersonic Strike capability. The framework, valued up to £1bn, is expected to cover a 7-year period. However, as the PIN points out, *"The value advised within this PIN is an estimate at this stage and subject to ongoing programme development."* Further, the PIN extends an invitation to suppliers for an Early Supplier Market Engagement Day to be held this summer. The notice mentions, *"The day will allow suppliers to gain valuable insight and provide feedback on this process and ensure the success of the Hypersonics programme."*

UK Hypersonic Capability? According to this excellent Parliamentary Briefing Paper, there is no universally accepted definition for the term 'hypersonic missile', however it is typically used to describe missiles that travel within the Earth's atmosphere for sustained periods at speeds greater than five times the speed of sound, whilst being able to make significant manoeuvres that change the missile's direction. ...

Australia, the US and the UK would collaborate on the development of hypersonic and counter-hypersonic capabilities via the AUKUS security partnership. The type of missions that a hypersonic missile could be used for will depend on the missile type, as well as its range, speed, type of warhead, and launch platform. Potential applications might include rapidly striking high-value, time-sensitive or mobile assets; long-range precision strikes; and enhancing nuclear deterrents.

Furthermore, in 2022, it was announced that Australia, the US and the UK would collaborate on the development of hypersonic and counter-hypersonic capabilities via the AUKUS security partnership. The type of missions that a hypersonic missile could be used for will depend on the missile type, as well as its range, speed, type of warhead, and launch platform. Potential applications might include rapidly striking high-value, time-sensitive or mobile assets; long-range precision strikes; and enhancing nuclear deterrents (although their potential effectiveness in this context is debated).

Source: https://ukdefencejournal.org.uk/uk-

launching-1bn-framework-to-boost-hypersonic-strike-capability/, 06 July 2023.

USA

Hyper Sonics Startup Specter Aerospace Raises $9.5 Million

Specter Aerospace, a hypersonic flight startup, announced that it has raised $9.5 million in funding from the US DoD and two venture capital firms, CS Ventures and Mandala Ventures. While the government portion of the funds had already been allocated, the investment has only now been publicly disclosed. There has been much activity in the field of hypersonics in recent months, with Swiss-based Destinus presenting its prototypes at the 2023 Paris Air Show, and its competitors Australia-based Hypersonix Launch System and US-based Hermeus proceeding apace with their respective test programs.

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Specter Aerospace, which is based in Boston, US, was set up in 2013 as FGC Plasma Solutions to develop plasma-assisted advanced propulsion technologies that enable aircraft to fly at hypersonic speeds, that is Mach 5 and faster. The startup's technology, which was developed with the support of the Argonne National Laboratory, a research center managed by the US Department of Energy and the University of Chicago, uses plasma injection to stabilize combustion in hypersonic jet and rocket engines offering reduced emissions and fuel consumption. The company claims this technology, which it expects to launch commercially in 2024, can also help conventional jet engines reduce fuel combustion and emissions.

Source: https://www.aerotime.aero/articles/hypersonics-startup-specter-aerospace-raises-9-5-million, 03 July 2023.

LIFT Starts Next Phases of Hypersonic Materials Development Work

LIFT, the Detroit-based Department of Defense (DOD) national manufacturing innovation institute, along with its ecosystem partners, has kicked off the next phase of its Hypersonics Thermal Management and Hypersonics Material Acceleration programs. The new program phases follow on LIFT original work on those two topics, both of which were launched in 2021 and are expected to wrap up this year. Operating at speeds of Mach 5 or higher, **hypersonics** and counter-hypersonic vehicles are among the DOD's top priorities, and understanding the materials required to survive these speeds is critical to further developing those vehicles.

LIFT, the Detroit-based Department of Defense (DOD) national manufacturing innovation institute, along with its ecosystem partners, has kicked off the next phase of its Hypersonics Thermal Management and Hypersonics Material Acceleration programs.

...The first phase of LIFT's material acceleration program focused on advancing metallic and ceramic materials and manufacturing processes involved in developing components for high-temperature and hypersonic applications. That work, with partners including Friedman Research Corporation (FRC), Michigan Technological University (MTU), University of Central Florida (UCF), University of Arizona (UofA), Alfred University, the University at Buffalo, Spectrum Engineering, and Hexagon, included development of integrated computational materials engineering (ICME) material digital twins, material property assessment, alloy development for hypersonic applications, and dissimilar material joining.

For the second phase of material acceleration work, LIFT will continue partnering with FRC and UCF while adding partnerships with Exothermics

and Materials Research & Design (MR&D) to extend the advancement of ceramic matrix composites (CMCs) produced via reactive melt infiltration, as well as metallics produced via large deformation processing, for use in hypersonic applications.

The first phase of LIFT's thermal management program advanced metallic materials and manufacturing processes used in high-temperature thermal applications including those produced by powder-based additive manufacturing techniques. ICME material digital twins were produced and validated against metal alloys to drive alloy development for the hypersonic environment. LIFT partners in phase one included FRC, UCF, UofA, and MTU.

In the second phase of the thermal management program, LIFT will work with FRC and UCF to advance the prediction of hypersonic material performance to hypersonic-relevant materials which benefit from functionally graded optimization and are manufactured by Direct Current Sintering (DCS). ...

Source: https://www. aerospace manu facturing anddesign. com/news/lift-starts-next-phases-hypersonic-materials-development-work/, 05 July 2023.

NUCLEAR ENERGY

AUSTRALIA

South Australian Uranium Miners Welcome Opposition Leader's Nuclear Energy Support

South Australia's potential to become the front runner for the introduction of nuclear energy in the nation has firmed with the state's opposition leader David Speirs highlighting its benefits in Parliament. In his State Budget reply speech, Mr Speirs said governments need to keep an open mind with regard to all energy solutions available in Australia, including nuclear power. "It may very well be that consideration of nuclear energy in some form, likely SMRs, will be necessary." "Perhaps it's time to reopen that Royal Commission – have a Royal Commission 2.0 – and start thinking about what South Australia's role could be in that fuel cycle, some seven years since we last considered it."

In 2015, a Royal Commission was conducted into South Australia's future role in the Nuclear Fuel Cycle. The Commission, led by former South Australian Governor Kevin Scarce, delivered its final report in May 2016 and recommended that the South Australian Government "pursue removal at the federal level of existing prohibitions on nuclear power generation to allow it to contribute to a low-carbon electricity system, if required.

In 2015, a Royal Commission was conducted into South Australia's future role in the Nuclear Fuel Cycle. The Commission, led by former South Australian Governor Kevin Scarce, delivered its final report in May 2016 and recommended that the South Australian Government "pursue removal at the federal level of existing prohibitions on nuclear power generation to allow it to contribute to a low-carbon electricity system, if required."

Positive news welcomed: Welcoming the positive development, the South Australian Chamber of Mines & Energy (SACOME) said that since the commission, no Government in South Australia has pursued this recommendation. SACOME chief executive officer, Rebecca Knol, said the comments from the opposition leader were welcomed and timely given the State continues to grapple with escalating electricity prices and a huge energy transition challenge, despite unparalleled renewables penetration. "Nuclear is a safe, reliable and affordable energy source, capable of generating baseload power with zero emissions," Ms Knol said. "Coupling modern SMR technology, with the state's abundant uranium, natural gas and renewable energy sources, would facilitate rapid decarbonisation and ensure South Australians have access to dependable and affordable power." "The findings from the Royal Commission still stand today. The Government needs to act in pursuit of overturning the Federal prohibition to enable it to be explored as part of

our future energy mix if we are to protect manufacturing and jobs."

No New Energy Plans in Place: While SACOME has consistently called for an Energy Transition Plan, Ms Knol said seven years into the energy transition, South Australia remains without a plan and has the highest electricity prices in the nation. "Australia is the only G20 nation that is not using or considering nuclear energy due to a Federal legislative prohibition. South Australia hosts 25% of the world's uranium which we export around the world, enabling other countries to meet their decarbonisation targets, just not our own."

In 2022, SACOME commissioned a community sentiment survey of 600 South Australians to evaluate the views of the public and see if they were open to a balanced conversation on nuclear energy. The survey found that 75% of South Australians support having an "informed and balanced conversation about having a nuclear energy industry in South Australia.

"An amendment to the Federal Environment Protection and Biodiversity Conservation Act 1999 – the removal of four words 'a nuclear power plant' – would allow industry to explore nuclear as part of South Australia's energy mix." Ms Knol called for a bipartisan support to enable fact-based policy development on nuclear energy. "We already have bipartisan support for nuclear powered submarines and uranium mining in our State. We now need bipartisan support for nuclear power to deliver a Net Zero future, reduce energy prices and maintain South Australian manufacturing and jobs."

Community Sentiment Positive: In 2022, SACOME commissioned a community sentiment survey of 600 South Australians to evaluate the views of the public and see if they were open to a balanced conversation on nuclear energy. The survey found that 75% of South Australians support having an "informed and balanced conversation about having a nuclear energy industry in South Australia." 58% of respondents also support progressing the necessary political conversations and legislative frameworks to enable future nuclear energy use in South Australia, while more than 6 in 10 adults agree that given recent cost and reliability issues of the Australian electricity market, all energy sources, including nuclear, should be on the table for consideration.

Boss Energy would be a Winner: Local uranium firm Boss Energy (ASX: BOE) is one company that would certainly benefit from a change of government policy. The company confirmed today that it is on target to restart production at the Honeymoon uranium project in South Australia by year end. The company is celebrating the completion of the first wellfield as it also nears completion on related gypsum pond and water treatment plants. Managing director Duncan Craib said completion of this milestone ensures Honeymoon remains on track for production in the December quarter, 2023.

Source: https://smallcaps.com.au/south-australian-uranium-miners-welcome-opposition-leaders-nuclear-energy-support/, 28 June 2023.

CANADA

First Submissions for Canadian Review of eVinci Design

The CNSC offers the VDR as an optional service to provide an assessment of a nuclear power plant design based on a vendor's reactor technology. It is not a required part of the licensing process for a new nuclear power plant, but aims to verify the acceptability of a design with respect to Canadian nuclear regulatory requirements and expectations. The three phases of the VDR process involve a pre-licensing assessment of compliance with regulatory requirements; an assessment of any potential fundamental barriers to licensing; and a follow-up phase allowing the vendor to respond to findings from the second phase.

Westinghouse applied in February 2018 to the CNSC for a VDR of the eVinci. A service agreement between the company and the CNSC was signed in September 2022, initiating the VDR process. Westinghouse is executing both Phases 1 and 2 of the VDR as a combined programme. Westinghouse has now provided four Phase 1

Focus Area submissions to the CNSC. Overall, more than 40 submissions will be filed during Phase 1 and Phase 2 of the VDR process." The submissions will enable early identification and resolution of potential regulatory and technical issues as the eVinci technology advances through the design process," the company said. Westinghouse is also planning to submit reports for joint review under the Memorandum of Cooperation between the US Nuclear Regulatory Commission (NRC) and the CNSC. The reports will focus on selected design aspects of the eVinci microreactor with the primary objective of establishing alignment and a common understanding of regulatory expectations.

In December 2021, Westinghouse submitted a pre-application regulatory engagement plan (REP) with the NRC for the microreactor, detailing the planned pre-licensing application interactions with the regulator. An REP helps reactor developers' early interactions with NRC staff and can reduce regulatory uncertainty and add predictability to licensing advanced technologies. In February this year, Westinghouse filed a Notice of Intent to submit key licensing reports for eVinci to the NRC and the CNSC for joint review including a common set of key requirements for the classification of systems, structures and components for the microreactor. This approach will enable deployment of a standard design in both the USA and Canada.

The eVinci microreactor is described as a "small battery" for decentralised generation markets and for microgrids, such as remote communities, remote industrial mines and critical infrastructure. The nominal 5 MWe heat pipe reactor, which has a heat capability of 14 MWt, features a design that Westinghouse says provides competitive and resilient power as well as superior reliability with minimal maintenance.

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Source: https://world-nuclear-news.org/Articles/First-submissions-for-Canadian-review-of-eVinci-de, 06 July 2023.

CHINA

Installation of Haiyang 4 Containment Starts

The CVBH - weighing about 660 tonnes - is the first of six modules that will make up the unit's steel containment vessel, which will eventually have an inner diameter of 39.62 metres and a height of 65.67 metres. The vessel is designed to confine and contain radiation in the event of an accident. The CVBH comprises 64 pre-fabricated arc-shaped steel plates, which were assembled and welded on site. It has been installed with 16 temporary supporting short columns, studs, mechanical penetrating parts and other items. In an operation lasting just over one-and-a-half hours, the component - with a total hoisting weight of about 756 tonnes - was hoisted into place on 30 June using a 3200-tonne crawler crane.

Installation of the CVBH marks "the official construction of the main structure of the nuclear island reactor building", SNERDI said. "The smooth hoisting of the CVBH module of unit 4 of the Haiyang Nuclear Power Plant has created good conditions for the subsequent critical path construction in the nuclear island reactor building, and also laid a solid foundation for the continuous construction of unit 4". First concrete was poured for the nuclear island of Haiyang 4 in April this year. It marks the official start of construction of the second of two CAP1000 pressurised water reactors - the Chinese version of the AP1000 - planned as Phase II of the plant. The planned construction period for Haiyang 3 and 4 is 56 months.

Source: https://www.world-nuclear-news.org/Articles/Installation-of-Haiyang-4-containment-starts, 05 July 2023.

Reactor Vessel and Steam Generators Shipped to Xudapu

The production of the equipment was carried out by AEM-Technologies, part of Rosatom-Atomenergomash. Xudapu units 3 and 4, in Liaoning province in China, are to feature VVER-1200 reactors. Igor Kotov, director general of JSC Atomenergomash, said: "The production of equipment for four power units in China is one of the key projects for the development of a strategic partnership in the energy sector between Russia and China ... in April of this year, the first set of equipment was shipped - a reactor and four steam generators for unit No 7 of Tianwan NPP, and today we shipped a set for unit No 3 of Xudapu NPP. Shipment for the next two power units of these stations will take place in 2024."

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The steam generators are heat exchangers, about 14 metres long, with a diameter of more than 4 metres and weighing 350 tonnes. The reactor vessel has a length of about 13 metres and a diameter of 4.5 metres and weighs 320 tonnes. In June 2018, Russia and China signed four agreements, including for the construction of two VVER-1200 reactors at the new Xudapu (also known as Xudabao) site. Agreements signed in June 2019 included a general contract for the construction of Xudapu units 3 and 4, as well as a contract for the supply of nuclear fuel.

Rosatom is designing the nuclear island and will supply key equipment, as well as providing field supervision, installation supervision, and commissioning services for the supplied equipment. Turbine generators and balance of plant will be supplied by China. Construction of Xudapu unit 3 began in July 2021, with that of unit 4 starting in May 2022. The 2019 agreements also included the construction of two VVER-1200 reactors as units 7 and 8 of the Tianwan plant, in Jiangsu province. They are scheduled to be commissioned in 2026-2027.

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Source: https://world-nuclear-news.org/Articles/Reactor-vessel-and-four-steam-generators-shipped-t, 11 July 2023.

INDIA

India's Kakrapar 3 Begins Commercial Operation

Kakrapar 3 is one of four 700 MWe PHWR units that received approval from the Indian government in 2007, alongside Kakrapar unit 4 and Rawatbhata units 7 and 8, in Rajasthan. Construction of the Kakrapar units formally began after site works were completed in 2010, and at that time the first unit was expected to be online by 2017. Kakrapar 3 achieved first criticality in July 2020, and the unit was connected to the grid in January 2021. According to media reports citing a "senior official" at the power plant, Kakrapar 3 was declared in commercial operation on 30 June at 10 am and was operating at 90% power. In late 2022, Minister of State Jitendra Singh told the Lok Sabha - the lower house of the Indian parliament - that the Kakrapar project was expected to reach completion this year, with completion of Rawatbhata 7 and 8 expected in 2026.

The Indian government has sanctioned the construction of ten 700 MWe PHWRs - not including Kakrapar 3 and 4 and Rajasthan units 7

and 8 - to be built in "fleet mode" by the end of 2031. These are: Kaiga units 5 and 6 in Karnataka; Gorakhpur units 3 and 4 in Haryana; Chutka units 1 and 2 in Madhya Pradesh; and Mahi Banswara units 1 and 2 and units 3 and 4 in Rajasthan. In addition, four Russian-supplied 1000 MWe VVER pressurised water reactors are under construction at Kudankulam: units 3 and 4, under construction since 2017, and units 5 and 6, under construction since 2021. A 500 MWe prototype fast breeder reactor is also under construction at Kalpakkam.

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Source: https://www.world-nuclear-news.org/Articles/India-s-Kakrapar-3-begins-commercial-operation, 04 July 2023.

PHILIPPINES

PP Pushed for Nuclear Energy Integration in Philippines

Public-private partnerships are being pushed for the successful integration of nuclear energy in the country's power mix. Speaking at the APEC Business Advisory Council (ABAC) forum yesterday (30 June), Aboitiz Group president and CEO Sabin Aboitiz, who is also a member of ABAC Philippines and vice chair of the ABAC Sustainable Growth Working Group, said private sector innovation and capital, coupled with public sector regulatory support and risk management, could drive the growth of nuclear energy....

Lotilla said the Department of Energy (DOE) is working with the National Economic and Development Authority on the enabling policy framework for private sector participation in the nuclear power space. He said Congress is also working on the legal and regulatory framework for nuclear power. The DOE is expected to include nuclear energy in the new Philippine Energy Plan that is expected to come out in September.

Aboitiz said governments could create enabling policies such as regulatory streamlining, transition financing, loan guarantees, and market-based incentives that promote nuclear energy and SMRs. He said businesses, meanwhile, could provide technical expertise, manage projects effectively, and ensure that they deliver on time and on budget. "The energy transformation we seek will not be easy, but it is essential for a sustainable future. The role of nuclear energy will be pivotal in this journey," Aboitiz said. "It calls for shared learning, private-public partnerships, and an imaginative exploration of new technologies and what they can do," he said.

Energy Secretary Raphael Lotilla said the agency is committed to work toward a sustainable future through a technology approach to clean alternative energy sources, which involves diversification of the country's energy sources to include nuclear power. ...Lotilla said the Department of Energy (DOE) is working with the National Economic and Development Authority on the enabling policy framework for private sector participation in the nuclear power space. He said Congress is also working on the legal and regulatory framework for nuclear power. ...

The DOE is expected to include nuclear energy in the new Philippine Energy Plan that is expected to come out in September. Lotilla said tapping nuclear energy is a long-term fuel option for power generation given its technical and economic viability. Aboitiz Power Corp. president and CEO Rubio said the company is considering nuclear technology as an option in the future, particularly SMRs. "As far as AboitizPower is concerned, we are in discussions with three proponents of nuclear technology, particularly SMRs," Rubio said. ... With the appropriate safety measures in place, the Aboitiz Group sees nuclear energy as not just a clean energy source but also a reliable one. Unaffected

by the vagaries of weather or geographical constraints, it is seen providing an effective baseload power source in a diverse and resilient energy mix. ...

Source: https://www.philstar.com/business/2023/07/01/2277747/ppp-pushed-nuclear-energy-integration-philippines, 01 July 2023.

USA

Nuclear Fusion Breakthrough: Decades of Research are Still Needed before Fusion can be Used as Clean Energy

The US Department of Energy reported a major scientific breakthrough in nuclear fusion science in December 2022. For the first time, more energy was released from a fusion reaction than was used to ignite it. While this achievement is indeed historic, it's important to pause and reflect on the way ahead for fusion energy. We are professors of sustainable and renewable energy engineering at Carleton University, where we research alternative energy technologies and systems that can move us to a low-carbon future. We also teach our students how to navigate the treacherous terrain from lab-based findings to real-world applications.

The US Department of Energy reported a major scientific breakthrough in nuclear fusion science in December 2022. For the first time, more energy was released from a fusion reaction than was used to ignite it. While this achievement is indeed historic, it's important to pause and reflect on the way ahead for fusion energy.

Defining System Boundaries: The efficiency of a potential fusion energy power plant remains to be seen. The reported fusion net gain actually required about 300 megajoules of energy input, which was not included in the energy gain calculation. This energy input, needed to power 192 lasers, came from the electric power grid. In other words, the experiment used as much energy as the typical Canadian household does in two days. In doing so, the fusion reaction output enough energy to light just 14 incandescent bulbs for an hour. The same is true of nuclear fission, which is the reaction inside current nuclear power plants. The complete fission of one kilogram of Uranium-235 — the fissile component of nuclear fuel — can generate about 77 terajoules. But we cannot convert all of that energy into useful forms like heat and electric power.

Instead, we have to engineer a complex system that can control the nuclear fission chain reaction and convert the generated energy into more useful forms. This is what nuclear power plants do — they harness the heat generated during nuclear fission reactions to make steam. This steam drives a turbine connected to an electric power generator, which produces electricity. The overall efficiency of the cycle is less than 40 per cent.

In addition, not all of the uranium in the fuel is burned. Used fuel still contains about 96 per cent of its total uranium, and about a fifth of its fissile Uranium-235 content. Increasing the amount of uranium spent in our current fleet is possible — it's an ongoing sphere of work — but it poses enormous engineering challenges. The huge energy potential of nuclear fuel is currently mitigated by the engineering challenges of converting that energy into a useful form.

Regardless of the efficiency of a future fusion power plant, taking energy conversions from basic science to the real world will require overcoming a multitude of challenges. Because fission faced many of the same challenges as fusion now does, we can learn a lot from its history. Fission also had to move from science to engineering before the commercial industry could take off. The science of fusion energy, as with nuclear fission, is rooted in efforts to develop nuclear weapons.

From Science to Engineering: Until recently, fusion has been seen primarily as a scientific experiment, not as an engineering challenge. This is rapidly changing and regulators are now investigating how deployment might unfold in the real world. Regardless of the efficiency of a future fusion power plant, taking energy conversions from basic science to the real world will require overcoming a multitude of challenges. Because fission faced many of the same challenges as fusion now does, we can learn a lot from its history. Fission also had to move from science to engineering before the commercial

industry could take off. The science of fusion energy, as with nuclear fission, is rooted in efforts to develop nuclear weapons. Notably, several nuclear physicists who helped develop the nuclear bomb wanted to "prove that this discovery was not just a weapon." The early history of nuclear power was one of optimism — of declarations the technology would advance and be able to meet our need for ever-increasing amounts of energy. Eventually, fusion power would come along and electricity would become "too cheap to meter."

Lessons Learned: What have we learned over the past 70 years since the onset of nuclear power? First, we've learned about the potentially devastating risk of technology lock-in, which occurs when an industry becomes dependent on a specific product or system. Today's light-water fission reactors — reactors that use normal water as opposed to water enriched with a hydrogen isotope — are an example of this. They were not chosen because they were the most desirable, but for other reasons.

These factors include government subsidies that favoured these designs; the US Navy's interest in developing smaller-scale pressurized water reactors for submarines and surface warships; advances in uranium enrichment technology as a result of the US nuclear weapons program; uncertainties regarding nuclear costs that led to the assumption that large light-water reactors are simply scaled-up versions of smaller ones; and conservatism regarding design choices given the high costs and risks associated with nuclear power development. We have been struggling to move to other technologies ever since. Second, we've learned that size matters. Large reactors cost more to build per unit of capacity than smaller units. In other words, engineers misunderstood the concept of economies of scale and doomed their industry in the process.

Large infrastructure projects are extremely complex systems that rely on enormous work forces and co-ordination. They can be managed, but they usually go over-budget and fall behind schedule. Modular technologies exhibit better affordability, cost control and economies, but micro and small nuclear reactors will also be economically challenged. Third, regulatory regimes must be developed for fusion. If the industry coalesces too quickly around a first-generation design, the consequences for the regulation of future reactors could be severe.

Fusion has an advantage because its technology is more of a blank slate than fission when it comes to public opinion. The positive associations the public has with fusion must be maintained by prudent design decisions and adopting best practices for community engagement. The same is true of how the industry will choose to handle the waste challenge. Fusion reactors generate large amounts of waste, though not the same kind fission does.

Fourth, choosing locations for new power plants and societal acceptance are key. Fusion has an advantage because its technology is more of a blank slate than fission when it comes to public opinion. The positive associations the public has with fusion must be maintained by prudent design decisions and adopting best practices for community engagement. The same is true of how the industry will choose to handle the waste challenge. Fusion reactors generate large amounts of waste, though not the same kind fission does.

A Call to Action: Our research on nuclear energy innovation reveals that challenges facing nuclear fusion can be overcome, but they require prudent leadership, decades of research, significant amounts of funding and focus on technology development. Billions of dollars are needed to advance nuclear fission technology, and we have far more experience with fission than with fusion. An appetite for funding must be demonstrated by governments, electric utility companies and entrepreneurs. Fusion's promise is vast and there is exciting work being done to advance it outside of this recent breakthrough, including by private companies. Decades of research and development are needed before fusion can meaningfully contribute to our energy system.

Our Central Message is a Call to Action: Fusion engineers, researchers, industry and government must organize to investigate and mitigate the challenges that face fusion, including in the design of the first generation of power plants. There is no substitute to deep and rapid decarbonisation

of the energy system if we want to save our planet from climate catastrophe. We are proud to be training the next generation of energy engineers to design new and better energy solutions.

Source: https://www.downtoearth.org.in/blog/science-technology/nuclear-fusion-breakthrough-decades-of-research-still-needed-before-fusion-can-be-used-as-clean-energy-90292, 28 June 2023.

GSE to Assist in US Control Room Upgrade Project

Under the contract, GSE will be responsible for reviewing and updating all the procedures and training programmes associated with a main control room modernisation project for two of the operator's reactors. GSE said it plans to ramp up staff this month for this contract and be fully staffed by the end of this year. Work is expected to be completed around the first quarter of 2025. The company noted funds allocated for this contract are dependent upon various deliverables and resources that are allocated to support each of the procedures and materials requested by the client.

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The client's modernisation project focuses on digitally transforming four major safety systems, including: the reactor protection system, the emergency core cooling system, the nuclear steam supply shutoff system and the redundant reactivity control system. These systems will all require operations and maintenance procedures and station training revisions for the modernisation project requirements over the next three years. GSE is tasked with writing or modifying more than 5400 procedures and revising and creating approximately 2800 lesson plans and test materials, including simulation training for the plant's Operations and Instructional Leadership Teams. ...

Source: https://world-nuclear-news.org/Articles/GSE-to-assist-in-US-control-room-upgrade-project, 11 July 2023.

NUCLEAR SAFETY

BELGIUM

IAEA Mission Commends Belgium's Commitment to Nuclear and Radiation Safety, Identifies Areas for Further Enhancement

An IAEA mission said the Government of Belgium and the national regulatory bodies have demonstrated their commitment to continuous improvement in nuclear and radiation safety while noting the need to identify and secure sufficient financial resources and competences for the regulator in light of Belgium's evolving nuclear energy context. The Integrated Regulatory Review Service (IRRS) team concluded a 12-day mission to Belgium from 19 to 30 June. The mission was conducted at the request of the Government of Belgium and hosted by the Federal Agency for Nuclear Control (FANC) and Bel V, that together form Belgium's regulatory body. It was part of the second IRRS cycle to Belgium. The first IRRS mission in Belgium took place in 2013, with a follow-up review in 2017.

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Using IAEA safety standards and international good practices, IRRS missions are designed to strengthen the effectiveness of the national regulatory infrastructure while recognizing the responsibility of each country for nuclear and

radiation safety. The IRRS team, comprising 19 senior regulatory experts from 18 Member States and three IAEA staff members, reviewed the regulatory oversight of facilities, activities, and exposure situations. Belgium operates five nuclear power reactors at two NPPs, Doel and Tihange that provide 46.4 % of the country's electricity production. In 2003, the Government had decided to phase out nuclear power by 2025 but opted in 2022 to take steps to extend the operation of two reactors – Doel 4 and Tihange 3 - until 2035. Two more reactors are in permanent shutdown. Other nuclear installations include research reactors, a radioactive waste treatment facility and an isotope production facility. In addition, medical and industrial applications of radioactive sources are widely used.

In 2003, the Government had decided to phase out nuclear power by 2025 but opted in 2022 to take steps to extend the operation of two reactors – Doel 4 and Tihange 3 - until 2035. Two more reactors are in permanent shutdown.

The review team conducted interviews and discussions with the FANC and Bel V staff. Members of the IRRS team also observed regulatory oversight activities at a nuclear power plant, a research reactor, a cyclotron for isotope production, a radioactive waste management facility, a nuclear medicine service in a hospital and a company for the transport of radioactive material. These visits included discussions with the management and staff of the facilities.

The IRRS team identified a good practice regarding the oversight of interfaces between safety and security. It particularly noted the conduct of annual inspections on this subject at nuclear power plants. The team considered that the main challenge in Belgium was to identify and ensure the necessary competences and adequate financial resources of the regulatory body due to the evolving nuclear energy policy in the country.

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"FANC is a mature regulatory body founded on a comprehensive regulatory framework, and Bel V as Technical Safety Organisation is fully engaged in supporting FANC in delivering its mandate. The uniqueness of Belgium's safety and security interface is a model for all countries to protect the environment, the public and the workers effectively," said IRRS team leader Ramzi Jammal from the Canadian Nuclear Safety Commission. "The Government of Belgium must continuously support the FANC to ensure its sustained readiness under any future national nuclear energy strategy," Mr Jammal added.

The IRRS team identified several areas of good performance, for example: The development and effective use of advanced IT systems for managing the regulatory activities; the development and implementation of the assessment of leadership for safety and safety culture within Bel V; and the way the regulatory body takes into consideration research and development results when preparing regulations and guides for radioactive waste management, including deep geological disposal. ...

The IRRS team also made several recommendations to further improve the regulatory system and the effectiveness of the regulatory functions in line with IAEA safety standards, such as: the Government should ensure that its decisions relating to the nuclear energy policy and the financial resources are made in a timely manner so that FANC fulfils its mandate under any circumstances; the regulatory body should complete the regulations in relation to site evaluation for future nuclear facilities; and the regulatory body should revise the regulations relating to specific aspects of decommissioning; radiation sources facilities and activities; occupational, medical and public

exposures; transport of radioactive material; and emergency preparedness and response. An Integrated Review Service for Radioactive Waste and Spent Fuel, Decommissioning and Remediation (ARTEMIS) mission is scheduled for later this year.

Source: https://www.iaea.org/newscenter/pressreleases/iaea-mission-commends-belgiums-commitment-to-nuclear-and-radiation-safety-identifies-areas-for-further-enhancement, 30 June 2023.

BULGARIA

IAEA Hosts First National Training Course on Safety Standards Overview in Bulgaria

The IAEA conducted for the first time at a national level, in Bulgaria, its comprehensive safety standards overview training course from 19 to 23 June. The course covered topical areas addressed by safety standards, their history, scope and structure, as well as their application in practice. Over 150 participants from regulatory bodies, regulatory bodies, technical support organizations, and operating organizations have attended the training since it began in Vienna last year. The Director of the Office of Coordination of the Department for Nuclear Safety, Shahid Mallick, said: "The request to conduct the course for interested parties in the country is an indication that the course is much needed. The knowledge on the IAEA safety standards is of high importance for ensuring safety of nuclear facilities and activities, including for those countries with long lasting experience in operation and regulating nuclear facilities and activities."

The IAEA safety standards are a series of publications that contain principles, requirements and recommendations to achieve a high level of nuclear and radiation safety worldwide. Since the first IAEA safety standard was published in 1958, they have served as the global reference for national regulatory systems, and many countries adopt the Agency's standards for use in their national regulations. They also form the basis for several international legal instruments, such as the Nuclear Safety Conventions.

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Participants were provided with a comprehensive introduction of all general and specific safety requirements and corresponding safety guides. Practical sessions focused on using various resources and tools including the Nuclear Safety and Security Online User Interface (NSS-OUI) to access and navigate the safety standards series. During the four-day event, the interactive panel discussions addressed specific aspects such as using a graded approach for applying safety standards to different nuclear and radiation facilities. Group discussion covered challenges in the application of safety requirements for their own organization, such as the role of staff in leadership and management for safety and detailed guidance for nuclear power plant configuration management. ...

Structure of the IAEA Safety Standards: The IAEA safety standards comprise Safety Fundamentals, Safety Requirements and Safety Guides. The Safety Fundamentals is the primary publication in the IAEA Safety Standards Series and establishes the fundamental safety objective and the ten principles of protection and safety. The publication is drafted in language that is

understandable to the non-specialist reader. It conveys the basis and rationale for the safety standards for those at senior levels in government and regulatory bodies. The Safety Requirements publications establish the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. The format and style of the requirements facilitate their use by Member States for the establishment, in a harmonized manner, of their national regulatory framework. The Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus on the measures recommended. The Safety Guides present international good practices, and increasingly best practices, to help users achieve high levels of safety

An IAEA safety review has concluded that Japan's plans to release treated water stored at the Fukushima Daiichi nuclear power station into the sea are consistent with IAEA Safety Standards. In a report formally presented by Director General Grossi to Japanese PM Kishida in Tokyo today, the IAEA also said that the discharges of the treated water would have a negligible radiological impact to people and the environment.

The water stored at the FDNPS has been treated through an Advanced Liquid Processing System (ALPS) to remove almost all radioactivity, aside from tritium. Before discharging, Japan will dilute the water to bring the tritium to below regulatory standards. Like elsewhere in the world, decisions related to nuclear safety are a national responsibility and Japan's Nuclear Regulation Authority (NRA) approved the plan in May.

Source: https://www.iaea. org/newscenter/news/ iaea-hosts-first-national-training-course-on-safety-standards-overview-in-bulgaria, 28 June 2023.

JAPAN

IAEA Finds Japan's Plans to Release Treated Water into the Sea at Fukushima Consistent with International Safety Standards

An IAEA safety review has concluded that Japan's plans to release treated water stored at the Fukushima Daiichi nuclear power station into the sea are consistent with IAEA Safety Standards. In a report formally presented by Director General Grossi to Japanese PM Kishida in Tokyo today, the IAEA also said that the discharges of the treated water would have a negligible radiological impact to people and the environment. The report is the outcome of nearly two years of work by an IAEA Task Force made up of top specialists from within the Agency advised by internationally recognised nuclear safety experts from eleven countries. They reviewed Japan's plans against IAEA Safety Standards which serve as a global reference for protecting people and the environment and contribute to a harmonized high level of safety worldwide.

"Based on its comprehensive assessment, the IAEA has concluded that the approach and activities to the discharge of ALPS treated water taken by Japan are consistent with relevant international safety standards," IAEA Director General Rafael Mariano Grossi said in a foreword of the report. "Furthermore, the IAEA notes the controlled, gradual discharges of the treated water to the sea, as currently planned and assessed by TEPCO, would have a negligible radiological impact on people and the environment," he added.

After taking the decision in April 2021 to discharge the water stored at the Fukushima Daiichi nuclear power station (FDNPS) into the sea, Japan requested the IAEA to conduct a detailed review of the safety related aspects of plan. IAEA Director General Grossi accepted Japan's request and committed to be involved before, during, and after the water discharges. The water stored at the FDNPS has been treated through an Advanced Liquid Processing System (ALPS) to remove almost

all radioactivity, aside from tritium. Before discharging, Japan will dilute the water to bring the tritium to below regulatory standards. Like elsewhere in the world, decisions related to nuclear safety are a national responsibility and Japan's Nuclear Regulation Authority (NRA) approved the plan in May.

The IAEA's review addressed all key safety elements of the water discharge plan in three major components: assessment of protection and safety; regulatory activities and processes; and independent sampling, data corroboration, and analysis. Over the past two years, the Task Force has conducted five review missions to Japan, published six technical reports, and met many times with the Japanese Government and Japan's TEPCO, the FDNPS operator, and analysed hundreds of pages of technical and regulatory documentation. Task Force members have also several times visited the site in eastern Japan to review discharge preparations there.

Kazakhstan plans to create a nuclear safety zone at the former Semipalatinsk test site and surrounding territories exposed to excess radioactive contamination, following the law "On the Semipalatinsk nuclear safety zone" signed by President Tokayev on July 5, reported the Akorda press service. With a mission to ensure nuclear and radiation safety, the area is created to rehabilitate the territory of the former nuclear test site for a gradual return of its lands to economic turnover.

...The IAEA's safety review will continue during the discharge phase. The Agency will also have a continuous on-site presence and provide live online monitoring on its website from the discharge facility. ...

Source: https://www.iaea.org/newscenter/pressreleases/iaea-finds-japans-plans-to-release-treated-water-into-the-sea-at-fukushima-consistent-with-international-safety-standards, 04 July 2023.

KAZAKHSTAN

Kazakhstan to Establish Semipalatinsk Nuclear Safety Zone

Kazakhstan plans to create a nuclear safety zone at the former Semipalatinsk test site and surrounding territories exposed to excess radioactive contamination, following the law "On the Semipalatinsk nuclear safety zone" signed by President Tokayev on July 5, reported the Akorda press service. With a mission to ensure nuclear and radiation safety, the area is created to rehabilitate the territory of the former nuclear test site for a gradual return of its lands to economic turnover.

A comprehensive environmental survey and state environmental expertise will determine contaminated sites, where the specialized zone will be established. In addition to creating and rehabilitating the zone, the law envisages limiting the spread of radioactive contamination, collecting, placing and disposing radioactive waste on the test site, and continuous monitoring of the level of radioactive contamination.

The President also signed the law "On introducing amendments and additions to some legislative acts of the Republic of Kazakhstan on the issues of the Semipalatinsk nuclear safety zone, ecology and electric power industry." The Soviet Union conducted more than 450 nuclear tests from 1949 until 1989 at the Semipalatinsk polygon in the eastern part of Kazakhstan.

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Suleimenov with a mission to close the Semipalatinsk test site and to inspire other nuclear countries to follow this example. In 1991, First President Nazarbayev signed a decree on the closure of the polygon.

Source: https://astanatimes.com/2023/07/kazakhstan-to-establish-semipalatinsk-nuclear-safety-zone/#:~:text=ASTANA%20%E2%80%93%20Kaz akhstan%20plans%20to%20create,reported%20the%20Akorda%20press%20service, 10 July 2023.

UKRAINE

Ukraine Conducts Safety Disaster Drills Near Zaporizhzhia Nuclear Plant

Ukraine began nuclear disaster response drills on Thursday (29 June) in the vicinity of the Russian-occupied Zaporizhzhia nuclear power station in the south of the country, regional officials said. Kyiv accused Russia this month of planning a "terrorist" attack at the plant involving the release of radiation. Moscow denied the accusation. Yuriy Malashko, the governor of the Zaporizhzhia region which includes the plant, said the drills had begun in the city of Zaporizhzhia and the district around it. Similar exercises started in the neighbouring Kherson region, Kherson region governor Oleksander Prokudin said. ...

The plant has been occupied by Russia since early March last year, shortly after Moscow's full-scale invasion. President Zelensky urged the international community this month to put pressure on Russia to end its occupation of the plant and guarantee nuclear safety. Kyiv and Moscow have accused each other of shelling the vast complex. Both sides have described this as "nuclear terrorism.

Prokudin said various officials and civil defence forces were working jointly on scenarios that might follow a nuclear disaster, and on how to inform and evacuate the population. Authorities were testing alert systems. The Zaporizhzhia nuclear power plant, Europe's largest, is located near the city of Enerhodar in southern Ukraine. The plant has been occupied by Russia since early March last year, shortly after Moscow's full-scale invasion. President Zelensky urged the international community this month to put pressure on Russia to end its occupation of the plant and guarantee nuclear safety. Kyiv and Moscow have accused each other of shelling the vast complex. Both sides have described this as "nuclear terrorism." ...

Source: https://www.ndtv.com/world-news/ukraines-nuclear-plant-disaster-drills-boost-safety-preparedness-4163225, 29 June 2023.

NUCLEAR SECURITY

RUSSIA

Russia Mercenary Threat Revives Concern over Nuclear Arsenal Security

The Wagner mercenary group's march on Moscow has revived an old fear in Washington: what happens to Russia's nuclear stockpile in the event of domestic upheaval. Images of tanks on Russian streets brought to mind the failed 1991 coup by communist hardliners that raised concerns about the security of the Soviet nuclear arsenal and the possibility of a rogue commander stealing a warhead, said former U.S. intelligence officials. "The IC (intelligence community) will be super-focused on the (Russian) nuclear stockpile," said Marc Polymeropoulos, a former senior CIA officer who oversaw the agency's clandestine operations in Europe and Eurasia.

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... Kadyrov dispatched thousands of his own

militiamen to Rostov-on-Don, the southern city seized and then abandoned by Prigozhin's fighters, vowing to help put down the revolt. To be sure, U.S. officials say they do not see an immediate threat to the security of Russia's strategic and tactical weapons. Kremlin spokesman Dmitry Peskov said the deal that sent Wagner fighters back to their camps was aimed at avoiding confrontation and bloodshed.

To be sure, U.S. officials say they do not see an immediate threat to the security of Russia's strategic and tactical weapons. Kremlin spokesman Dmitry Peskov said the deal that sent Wagner fighters back to their camps was aimed at avoiding confrontation and bloodshed. "We have not seen any changes in the disposition of Russian nuclear forces," said a National Security Council spokesperson in response to questions from Reuters.

"We have not seen any changes in the disposition of Russian nuclear forces," said a National Security Council spokesperson in response to questions from Reuters. "Russia has a special responsibility to maintain command, control, and custody of its nuclear forces and to ensure that no actions are taken that imperil strategic stability."

But the safety of these weapons is a persistent worry for Washington. U.S. intelligence agencies said in their 2023 Annual Threat assessment that "Russia's nuclear material security…remains a concern despite improvements to material protection, control, and accounting at Russia's nuclear sites since the 1990s." Nuclear chain of command A congressional aide noted that the Kremlin has pumped extra resources into modernizing its arsenal in recent years, adding that, "Russia's strategic forces have generally been in ship-shape." The scenario worrying planners now may be the possibility of a rogue military faction gaining decision-making ability over some of the weapons should divisions over the war in Ukraine exposed by Prigozhin's mutiny erupt anew.

Russia's nuclear arsenal is the world's largest, estimated in 2022 at 5,977 warheads by the Federation of American scientists, compared to an estimated 5,428 held by the U.S. Collecting information on Russia's strategic forces command structure and the security and other aspects of the stockpile long has been among U.S. spy agencies' highest priorities, the former CIA officers said.

The US and its allies would be left to wonder how any new authority would use the weapons, said Hoffman. "It's the ability to extort the West for whatever you want. And they might not play by the same sort of rules that Putin has," he said, noting how the Russian leader has not acted on nuclear threats he has made in response to the West's support for Ukraine's fight against Russian occupation forces. Russia's nuclear arsenal is the world's largest, estimated in 2022 at 5,977 warheads by the Federation of American scientists, compared to an estimated 5,428 held by the U.S. Collecting information on Russia's strategic forces command structure and the security and other aspects of the stockpile long has been among U.S. spy agencies' highest priorities, the former CIA officers said.

That work became harder with Putin's August 2022 decision to halt U.S. inspections of Russia's nuclear sites under the New START treaty, which allowed the sides to inspect and monitor each other's strategic nuclear forces. That decision left Washington highly dependent on spy satellites to assess the security of nuclear weapons sites and movements of warheads, and communications intercepts to monitor the loyalty of Russian commanders, said Polymeropoulos. "This has always been a super-high (U.S.) intelligence collection priority and the command and control of nuclear weapons in Russia," said Hoffman. "We all know it's dangerous, which is why we had all these treaties, where we had a lot of transparency, which is now gone."

Source: https://www.deccanherald.com/international/world-news-politics/russia-mercenary-threat-revives-concern-over-nuclear-arsenal-security-1230981.html, 25 June 2023.

Wagner Neared Russian Nuclear Base During Rebellion

Wagner mercenaries came close to reaching one of Russia's nuclear weapons storage sites during their short-lived revolt last month, Reuters reported, based on accounts from Ukrainian and Russian officials, local residents, and geo-located videos of the fighters. Reuters said it tracked the movements of a 75-vehicle Wagner column that split off from the main convoy advancing from southern Russia to Moscow on June 23 and reached as close as 110 kilometers from the Voronezh-45 military base. Voronezh-45 is a nuclear weapons storage site operated and guarded by part of the Russian Defense Ministry's 12th Main Directorate, which is responsible for protecting the country's nuclear arsenal.

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Local residents reported sporadic gunfire and explosions along Wagner's route, including the downing of a Russian military helicopter at the small column's last identifiable location in the Voronezh region town of Talovaya. One resident told Reuters that Wagner fighters remained in Talovaya until Sunday (16 July) when they turned around and returned south.

The head of Ukraine's military intelligence Kyrylo Budanov suggested — without providing evidence — that an unspecified number of Wagner fighters pressed on to Voronezh-45 and "came close" to acquiring nuclear weapons and escalating the mutiny. "The doors of the storage were closed and they didn't get into the technical section.

But the head of Ukraine's military intelligence Kyrylo Budanov suggested — without providing evidence — that an unspecified number of Wagner fighters pressed on to Voronezh-45 and "came close" to acquiring nuclear weapons and escalating the mutiny. "The doors of the storage were closed and they didn't get into the technical section" Budanov told Reuters in a video interview.

Nuclear weapons experts told Reuters that even if Wagner fighters had managed to acquire nuclear weapons, they would have found it "virtually impossible" to break through several layers of security to assemble or detonate the bombs. Others cast doubt on whether the specific nuclear weapons stored at Voronezh-45 were operational, characterizing them as "old crap stuck in storage."

Source: https://www.themoscowtimes.com/2023/07/11/wagner-neared-russian-nuclear-base-during-rebellion-reuters-a81796, 11 July 2023.

SMALL MODULAR REACTORS

CANADA

NB Power, ARC Move Forward with Small Modular Reactor

NB Power and ARC Clean Technology Canada have made new strides toward constructing and operating an advanced SMR on the site of an existing nuclear power plant in New Brunswick, Ontario. NB Power, the provincial electric utility that has been around for more than 100 years, submitted an Environmental Impact Assessment registration document to the Department of Environment and Local Government and a (License) to Prepare Site Application to the Canadian Nuclear Safety Commission on the advanced SMR project. The new reactor project

will be on the site of the existing Point Lepreau Nuclear Generating Station in New Brunswick.

Clean energy company ARC has been working on the development of the ARC-100, a modular, advanced sodium-cooled fast reactor that will generate at least 100 megawatts of electricity, since 2018. NB Power has provided technical support for the project. The project is the first deployment of an on-grid advanced SMR facility in Canada and is considered to be a key objective of Stream 2 of the "Strategic Plan for the Deployment of SMR" a strategic plan prepared by the governments of New Brunswick, Ontario, Alberta, and Saskatchewan in 2022. The plans come as NB Power recently launched its strategic plan, dubbed Energizing Our Future, with the goal of phasing out coal by 2030 and achieving net-zero supply by 2035 while maintaining energy security.

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The company expects to develop strategic partnerships to complete the reactor project, which will help provide accountability, transparency, and long-term sustainability for the project. SMR projects have been the source of some excitement in the energy sector for some time with their potential to store energy. Earlier this year, Dox and X-energy partnered to develop an advanced nuclear reactor to make chemical compounds.

Source: https://www. environmentalleader.com/2023/07/nb-power-arc-move-forward-with-small-modular-reactor/, 06 July 2023.

Ontario Power Generation, Province Plan 3 More Small Modular Reactors at Darlington Plant

Ontario is planning three more SMRs at the site of the Darlington nuclear power plant, an announcement that comes the same week the energy minister said the province is moving forward with a new, large-scale nuclear facility. The power generated by the SMRs — four in total, with one already being built at Darlington, located in Clarington, Ont., which is about 70 kilometres east of Toronto — and the large plant planned at Bruce Power on the shore of Lake Huron would be 6,000 megawatts, or enough to power the equivalent of six million homes around the mid-2030s.

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That is around when electricity demand is projected to start rising even more quickly and forecasts from the Independent Electricity System Operator from before the recent spate of announcements show a supply gap of about 5,000 megawatts at that time. Energy Minister Todd Smith pointed to electric vehicle battery plants being built in Windsor, Ont., and St. Thomas, Ont., along with battery component manufacturing facilities such as Umicore in eastern Ontario and transitioning steel production from coal to electricity in Hamilton and Sault Ste. Marie, Ont. "These five investments alone are going to increase annual electricity demand by eight terawatt hours a year," Smith said. "How much is that, you say? Well, that's the equivalent to the annual electricity

consumption of the Ottawa region." Smith also noted that the province is working toward building 1.5 million new homes by 2031 and that electric vehicle use is expected to keep increasing. SMRs use similar technology to traditional nuclear power plants, but they are much smaller.

Nuclear Reactors to Help End Reliance on Natural Gas: Building new nuclear reactors was one of the recommendations in a report late last year by the IESO, which looked at how the province could end its reliance on natural gas to generate electricity, even in the face of sharply rising demand. It found that the province could fully eliminate it from the electricity system by 2050, starting with a moratorium in 2027, but it will require about $400 billion in capital spending and more generation including new, large-scale nuclear plants, more conservation efforts, more renewable energy sources and more energy storage.

Subject to the regulatory approvals, the additional three SMRs could come online between 2034 and 2036. Construction on the first one is set to be complete by 2028. Smith announced Wednesday (5 July) that pre-development work was starting to build a new, large-scale nuclear plant on the site of Bruce Power's current generating station on the shore of Lake Huron in Tiverton, Ont.

The IESO has said that natural gas is required to ensure supply and stability in the short to medium term, but that it will also increase greenhouse gas emissions from the electricity sector. Environmental advocates have said Ontario could meet its energy needs through renewables rather than gas, and some raise concerns about nuclear power due to its cost and the waste it generates. A group of MPs also warned in April of risks with forging ahead with SMRs, as they are still relatively untested, not being widely used anywhere in the world. Smith said he is confident that Ontario Power Generation (OPG) will ensure the project's success. ...

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Source: https://www.cbc.ca/news/canada/toronto/ontario-darlington-nuclear-plant-1.6899969, 07 July 2023.

GENERAL

IAEA Initiative Advances Efforts to Support the Safe, Secure Deployment of SMRs

Around the world, countries are turning to nuclear energy to mitigate climate change and to improve energy security. Novel reactor designs are entering the scene, along with new modular manufacturing methods, all of which provide opportunities and challenges for deployment. An IAEA initiative is finding common ground among regulators, designers, operators and other stakeholders to support the safe and secure deployment of these advanced reactors, including SMRs.

The Nuclear Harmonization and Standardization Initiative (NHSI), launched in 2022, is actively developing a series of tools and publications to help advanced reactors become part of the solution addressing climate change and energy security. On 28 June, more than 120 NHSI participants convened, in person and virtually, to take stock of progress since last year's inaugural meeting and to set priorities for the year to come. By making progress towards harmonizing regulatory approaches and standardizing industrial approaches, NHSI aims to support the timely deployment of advanced reactors to maximize their contribution to reach net zero goals. Technical publications and toolkits are expected to be available by the end of 2024.

NHSI participants work in two separate but complementary tracks: the NHSI Regulatory Track and the NHSI Industry Track. Both tracks have

topical working groups, and over the past year, both held 16 working group meetings. IAEA Director General Grossi outlined the benefits of NHSI's work. Harmonization of the regulatory process reduces uncertainty, and it helps to lower the cost of building and deploying SMRs, he stated in his opening remarks. ...

A Global Review Framework: Regulatory Track participants have produced approaches that will help countries to work together in SMR regulatory reviews, sharing resources and knowledge. "The implementation of these approaches will help regulators to learn from each other, increasing their trust that other regulatory frameworks that may initially seem different, are able to achieve good results" said Paula Calle Vives, Senior Nuclear Safety Officer at the IAEA. In addition, the IAEA is planning to gather feedback on the implementation of these approaches and is investigating options for developing a repository of information on regulatory reviews. "The work we are doing is not necessarily aiming to harmonize regulatory requirements but to harmonize how the requirements are met and demonstrated," said Anna Bradford, Director of Nuclear Installation Safety at the IAEA and Chair of the Regulatory Track.

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One of the three working groups in the Regulatory Track aims to develop a process to leverage other regulators' reviews to save resources and learn from the expertise and experience of other regulators. It is also developing a process for regulators to collaborate and share their perspectives on reviews of the same nuclear reactor design. Most participants expressed support for avoiding duplication of regulatory reviews. ...

Standardized Industrial Approaches: For the nuclear industry, NHSI is identifying common approaches on codes and standards used as a part of design, manufacturing, construction, commissioning and operation of advanced reactors, like SMRs. ... One of the main objectives of the Industry Track is to harmonize high-level user requirements. An international reference is under development to help regulatory bodies understand what future licensees expect and to help embarking or expanding nuclear power countries structure their specifications for prospective suppliers.

The Industry Track is also forming a network and associated platform for resource sharing on experiments and code validation for SMRs. The IAEA Network for Experiment and Code Validation Sharing (NEXSHARE) is expected to launch next year, in conjunction with a workshop and publication on participating experimental facilities. "Sharing information on experiment and code validation does not necessarily mean sharing data but identifying what is available, what work is being conducted, what are the gaps and what facilities are currently available," des Cloizeaux said. Regulatory and industry representatives shared feedback and suggestions on the work that has occurred, thus far, and possible areas for enhancement going forward. The timeliness and relevance of NHSI's work, which will be beneficial for both mature and embarking nuclear power countries, is underscored by the need to transition to clean

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energy and to meet energy demands. "NHSI can be a game changer if we all work together and commit our resources to bring it to a successful outcome," Mr Grossi said. NHSI is composed of 30 countries, 94 unique organizations and more than 200 contributors. The next NHSI plenary is planned for 2024.

Source: https://www.iaea.org/newscenter/news/iaea-initiative-advances-efforts-to-support-the-safe-secure-deployment-of-smrs, 28 June 2023.

SLOVENIA

Slovenia's New National Planning Strategy Allows Construction of Modular Nuclear Reactors

A new national spatial planning strategy that explicitly paves the way not just for the planned expansion of the country's only nuclear power station but also for the construction of SMRs was approved by Slovenia's parliament. The strategy, which sets the national planning framework until 2050, creates the legal basis for starting procedures for Krško 2, the planned new unit at the Krško nuclear power station, Natural Resources Minister Uroš Brežan said. ...The strategy does not mention a precise location for Krško 2, which will be the subject of subsequent administrative procedures. Previous statements by officials indicate it is likely Krško 2 will be built adjacent to the existing installation.

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The document, however, also opens the possibility of building multiple SMRs around the country, according to Brežan. SMRs, with a capacity of up to 300 MW, are a technology still in its infancy but expected to mature within the next decade. Westinghouse, which built Krško in the 1970s, is one of the companies developing SMRs and US officials have been lobbying in favour of SMRs in Slovenia for years. Russia and China are the only countries with operating SMRs, but Slovenia has said any expansion of nuclear power will be based on Western technology.

Source: https://www.euractiv.com/section/politics/news/slovenias-new-national-planning-strategy-allows-construction-of-modular-nuclear-reactors/, 30 June 2023.

SOUTH KOREA

South Korea forms SMR Alliance

Business agreements were signed between the participating organisations at a launch ceremony held in Seoul on 4 July. The SMR Alliance includes 11 government and public institutions, including the Ministry of Trade, Industry & Energy (MOTIE), Korea Hydro & Nuclear Power (KHNP) and the Korea Energy Economics Institute, as well as 31 companies, including GS Energy, SK Inc, Samsung C&T, Daewoo E&C and Doosan Enerability. The SMR Alliance plans to establish SMR business strategies and establish an institutional foundation with the goal of fostering public and private capacities to strengthen national competitiveness in the SMR field. To this end, it operates working groups by sector, such as a business development working

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group and an institutional improvement working group.

The alliance plans to prepare suggestions for business models and institutional improvements by the first half of 2024 and aims to promote the launch of the SMR association and actively support the creation of the SMR ecosystem from the first half of next year. Speaking at the launch event, Minister of Industry Lee Chang-yang said: "The public and private sectors must jointly respond to the changes that SMRs will bring. Companies will prepare business plans that the people can trust, and the government will spare no policy support to foster the SMR industry."

...In April, US nuclear innovation company TerraPower announced it had signed a collaboration agreement with SK and KHNP supporting the demonstration and commercialisation of its Natrium SMR and integrated energy system.

SK Inc and SK Innovation - both affiliates of SK Group, Korea's second-largest conglomerate - invested USD250 million in TerraPower in August last year during an equity raise of USD830 million, the largest private raise among advanced nuclear companies to date. In August last year, MOTIE signed a memorandum of understanding with KHNP, Doosan Enerbility and nuclear energy equipment and materials manufacturers with the aim of revitalising South Korea's nuclear industry. The MoU aims to improve the competitiveness of the nuclear industry ecosystem through shared growth, working together to contribute to carbon neutrality, responding to the energy crisis and stabilisation of power supply.

Korea's SMART (System-integrated Modular Advanced Reactor) is a 330 MWt pressurised water reactor with integral steam generators and advanced safety features. The unit is designed for electricity generation (up to 100 MWe) as well as thermal applications, such as seawater desalination, with a 60-year design life and three-year refuelling cycle. While the basic design is complete, development has been stalled by the absence of any orders for an initial reference unit. Developed by the Korea Atomic Energy Research Institute (KAERI), SMART received standard design approval from the Korean regulator in mid-2012. KAERI had planned to build a demonstration plant to operate from 2017.

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Source: https://world-nuclear-news.org/Articles/South-Korea-forms-SMR-Alliance, 05 July 2023.

NUCLEAR COOPERATION

CHINA–PAKISTAN

China Signs $4.8bn Nuclear Deal with Pak

China has recently signed a nuclear energy deal with Pakistan worth $4.8 billion, accelerating its efforts towards civil nuclear cooperation, in a curious move to seek export customers in a market dictated by the West and Russia. In June this year, China and Pakistan signed a nuclear energy deal worth 4.8 billion dollars, which experts believe is a prying move on part of Beijing, done at a time when it has already had a jarring ride on its investments in Pakistan's power business and has had to suffer to sapping cash crunch due to shortage of Islamabad's foreign exchange reserves and fears of an economic meltdown.

Experts believe that China's latest civil nuclear cooperation deal with Pakistan seems to be inclined towards more on strategic ambitions than economics. ...As per details of the nuclear deal, China will build a 1,200 megawatt plant at the Chashma nuclear power complex in central Pakistan, featuring it as Beijing's first indigenous civil nuclear reactor, the Hualong One. Hualong

One is a third-generation pressurised water reactor, which was built with Chinese assistance and currently produces 1,230 MW to the national grid. While China is becoming one of the most prolific builders of nuclear plants; its export plans for Pakistan are ambitious, stemming from suggestions that by 2030, China could build at least 30 overseas reactors, spread across countries participating in its Belt and Road Initiative (BRI).

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Source: https://punemirror.com/news/world/china-signs-usd4-8bn-nuclear-deal-with-pak/cid1688438450.htm, 04 July 2023.

RUSSIA–MYANMAR

Myanmar and Russia Push Ahead with Nuclear Energy Cooperation

The meeting, headed by Myanmar's Deputy Science and Technology Minister Zeya and Rosatom Deputy Director General Spassky, also covered the "regulatory framework for bilateral cooperation" as well as training of personnel and issues related to public opinion on nuclear energy. Rosatom said that "following the meeting, a protocol was signed". Spassky also held meetings with Minister of Science and Technology Kyaw and Minister of Electrification Taung, at which, according to Rosatom, "priority issues of cooperation were discussed in detail, with an emphasis on the construction of Russian-designed power units and the arrangement of nuclear infrastructure in Myanmar in accordance with the requirements of the International Atomic Energy Agency".

According to the Myanmar government's Ministry of Information, "during the meeting, the pre-feasibility study report of the thermal power plant project conducted under the memorandum of understanding signed by the Ministry of Electric Power and Rosatom in November 2022 was presented by Rosatom to the Ministry of Electric Power. In addition, a MoU in the field of Nuclear Infrastructure Assessment and Enhancement was signed between the Ministry of Science and Technology and Rosatom.

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Source: https://www.world-nuclear-news.org/Articles/Myanmar-signs-fresh-MoU-with-Russia-over-nuclear-e, 29 June 2023.

SOUTH KOREA–SLOVENIA

S. Korean, Slovenian FMs Discuss Cooperation in Nuclear Energy, Science Technology

The top diplomats of South Korea and Slovenia held consultations to discuss ways to strengthen

bilateral ties in areas of nuclear power plants and science technology, Seoul's foreign ministry said. During their talks held in Seoul, Foreign Minister Park Jin and his Slovenian counterpart, Tanja Fajon, agreed to broaden shipping and logistics cooperation, highlighting an agreement signed between South Korea's port city of Busan and the Slovenian port of Koper earlier this month. Park also asked for Slovenia's support in South Korean companies' business endeavors in Slovenia, including their bid to participate in the construction of a new unit in the country's Krsko nuclear power plant.

Exact specifications for the *Damavand-2* are unknown, although analysis of imagery suggests a vessel approximately 1,500 tonnes displacement and around 100m in length. The vessel is likely a continuation or sub variant of the *Moudge*-class light frigates operated by the Iranian Navy. By comparison, the UK's Batch 2 River-class offshore patrol vessels displace around 2,000t and are just over 90m in length.

Further, Park highlighted South Korea's recent election to the UNSC for the 2024-25 term as a non-permanent member, and asked for Slovenia to join international efforts against North Korea's evolving missile and nuclear threats. Fajon expressed hopes for strengthened bilateral cooperation in areas of digital, automobiles and advanced technologies, the ministry said.

Source: http://www.koreatimesus.com/s-korean-slovenian-fms-discuss-cooperation-in-nuclear-energy-science-technology/, 30 June 2023.

SOUTH KOREA–USA

Korea, US Discuss Nuclear Security Cooperation in Working Group Meeting

Korea and the US have discussed bilateral cooperation in the field of nuclear security in their latest working group meeting held this week, Seoul's foreign ministry said. The sixth Korea-U.S. Nuclear Security Working Group Meeting, co-led by Yoon Jong-kwon, director-general for nonproliferation and nuclear affairs at the ministry, and Art Atkins, assistant deputy administrator of the U.S. National Nuclear Security Administration, was held in Seoul, according to the ministry.

The group is among four working groups under the High-Level Bilateral Commission, which was launched in 2016 following the 2015 revision of the two countries' nuclear energy cooperation agreement. According to the ministry, the two sides agreed to continue their close cooperation in minimizing the production of highly enriched uranium, strengthening the cybersecurity of nuclear facilities, and boosting preparedness and responsiveness to nuclear and radiological terrorism. They also agreed to cooperate in the leadup to next year's International Conference on Nuclear Security, scheduled to be held in Vienna, Austria, in May.

Source: https://koreatimes.co.kr/www/nation/2023/06/120_353777.html, 27 June 2023.

NUCLEAR PROLIFERATION

IRAN

Iran Claims Naval Hypersonic Capability – But Is It Viable?

Iran's regime has claimed a capability that few other countries on the planet have been able to achieve, save a few select nations led by the US and China – fielding hypersonic missiles on a naval vessel. A number of Iranian state news outlets on 3 July published articles stating that the head of the Iranian Navy, Rear Admiral Shahram Irani, claimed the new *Damavand-2* frigate would be equipped with hypersonic missiles. The state-run *IRNA* news agency said that the *Damavand-2* would be commissioned into service with the Iranian Navy in the coming days.

Exact specifications for the *Damavand-2* are unknown, although analysis of imagery suggests a vessel approximately 1,500 tonnes displacement and around 100m in length. The vessel is likely a continuation or sub variant of the *Moudge*-class light frigates operated by the Iranian Navy. By comparison, the UK's Batch 2 River-class offshore

patrol vessels displace around 2,000t and are just over 90m in length. With such a light displacement and dimensions of the *Damavand-2*, it is unclear how Iran, if its claims are valid, has been able to accommodate hypersonic missiles. Loosely defined, a hypersonic missile should be capable of travelling at speed in excess of Mach 5, up to Mach 25 and beyond.

Iran has previously claimed to have developed advanced military hardware, such as a fifth-generation stealth fighter, the Qaher 313, in 2013, although its claims were widely dismissed as propaganda with the platform appearing to be unsuitable for flight and potentially just a ground mock-up.

The US-Japanese RIM-161 Standard Missile 3 (SM-3) Block IIA, developed by Raytheon and Mitsubishi, is an exo-atmospheric anti-air missile, purportedly capable of travelling at speed of up to 4.5km/s, or around Mach 13. Measuring around 6.7m in length, the SM-3 can be fired from the Mk 41 vertical launch system (VLS) commonly fitted to US and Japanese warships. US manufacturer of the Mk 41 VLS, Lockheed Martin, states that the module is available in two sizes: strike and tactical length. The strike module is 7.6m long and typically house larger cruise missiles and ballistic missile defence munitions, while the smaller tactical module measures 6.7m in length. China has flight tested its DF-ZF hypersonic anti-ship missile, although its length of around 11m is considerably larger than US alternatives. Other hypersonic missiles operated by China include the ship-borne hypersonic YJ-21, which are in service aboard the PLAN's Type 055 destroyers.

A US intelligence assessment released on 10 July sa[id] Iran is not currently pursuing nuclear weapons but has ramped up activities that could help it develop them. The assessment from the Office of the Director of National Intelligence states that Iran has moved to increase its capacity to produce an atom bomb since 2020 but has stopped short of that so far.

Is Iran's Hypersonic Claim Viable, or Another Qaher 313? Iran has previously claimed to have developed advanced military hardware, such as a fifth-generation stealth fighter, the Qaher 313, in 2013, although its claims were widely dismissed as propaganda with the platform appearing to be unsuitable for flight and potentially just a ground mock-up. However, Harshavardhan Dabbiru, aerospace and defence analyst at GlobalData, said Iran does have a homegrown missile design and manufacturing capability, with any such system fitted to be *Damavand-2* likely based on the recently unveiled Fattah 2 hypersonic ballistic missile.

Capability claims for the Fattah, which appears to measure around 10m in length, include a speed of Mach 13-15 and range of around 1,400km. "Iran's homegrown missile manufacturing capabilities are steadily advancing, and the country in recent years has developed several land attack missiles, including the Dezful, Fattah, Hajj Qasem Soleimani, Kheibar Shekan, Khorramshahr-4 (Kheibar), and Rezvan," Dabbiru said, adding that while Iranian capabilities "seem exaggerated", they were "not far-fetched". ...

Source: https://www.naval-technology.com/features/iran-claims-naval-hypersonic-capability-but-is-it-viable/#catfish, 04 July 2023.

US Intelligence Finds Iran Not Currently Developing Nuclear Weapons

A US intelligence assessment released on 10 July sa[id] Iran is not currently pursuing nuclear weapons but has ramped up activities that could help it develop them. The assessment from the Office of the Director of National Intelligence states that Iran has moved to increase its capacity to produce an atom bomb since 2020 but has stopped short of that so far. The findings corresponded with previous US assessments about Iran's nuclear programme, although many in Congress and elsewhere have been sceptical of those.

President Joe Biden's administration has been defending its desire to return to the 2015 nuclear deal with Iran, known as the Joint Comprehensive Plan of Action, or JCPOA, since it first took office. That effort has been complicated in recent months by the suspension of its chief negotiator, Rob Malley, who was placed on unpaid leave last month pending an investigation into claims he mishandled classified information. "Iran is not currently undertaking the key nuclear weapons-development activities that would be necessary to produce a testable nuclear device," the two-page unclassified synopsis of the report reads.

Iran is also pursuing "research and development activities that would bring it closer to producing the fissile material needed for completing a nuclear device following a decision to do so", the report said. In that regard, Iran continues to violate the terms of the 2015 nuclear deal regarding uranium enrichment that it agreed to with world powers, the report said.

However, Iran is also pursuing "research and development activities that would bring it closer to producing the fissile material needed for completing a nuclear device following a decision to do so", the report said. In that regard, Iran continues to violate the terms of the 2015 nuclear deal regarding uranium enrichment that it agreed to with world powers, the report said. Donald Trump's administration withdrew from that agreement in 2018. "Iran continues to increase the size and enrichment level of its uranium stockpile beyond JCPOA limits," the report said. It added that it also continues to exceed JCPOA restrictions on advanced centrifuge research and development.

These findings have been generally supported by inspections from the UN's nuclear watchdog, the International Atomic Energy Agency. In addition to the nuclear findings, the US intelligence report said that Iran's ballistic missile programme continues to pose a significant threat to countries across the Middle East. "Iran has emphasised improving the accuracy, lethality, and reliability of its missiles," it said.

Source: https://www.thenationalnews.com/world/us-news/2023/07/10/us-intelligence-finds-iran-not-currently-developing-nuclear-weapons/, 11 July 2023.

NUCLEAR NON-PROLIFERATION

IRAN

Iran Says Recent Nuclear Talks with Europe 'Explicit, Constructive'

Iranian Foreign Minister Hossein Amir-Abdollahian has said that the recent talks with the European parties on the revival of a 2015 nuclear deal were "explicit and constructive". Amir-Abdollahian made the remarks on Tuesday (4 July) in a phone call with the European Union Foreign Policy chief Josep Borrell, when commenting on the talks to salvage the nuclear deal, formally known as the JCPOA, Xinhua news agency reported, citing a statement released by the Iranian Foreign Ministry.

He highlighted the importance of continuing dialogue between Iran and Europe with the aim of achieving a common understanding, saying Borrell and the EU deputy foreign policy chief Enrique Mora have played "constructive" roles in the nuclear talks while the new EU special representative for the Gulf region Luigi Di Maio has "constructive" relations with Iran. Speaking of the possible solutions to the conflict between Russia and Ukraine, Amir-Abdollahian said Iran has always supported global peace and stability and maintains that stopping the conflict is only possible through political initiatives. Borrell, for his part, said the ongoing cooperation and negotiations between Iran and the International Atomic Energy Agency will be "fruitful and positive"....

Source: https://www.daijiworld.com/news/newsDisplay?newsID=1096519, 05 July 2023.

Blinken Says No Nuclear Deal on Table with Iran

U.S. Secretary of State Blinken said Wednesday (28 June) that no new nuclear agreement was on the table with Iran, after quiet new diplomacy between the adversaries. "There is no agreement in the offing, even as we continue to be willing to explore diplomatic paths," Blinken said at the Council on Foreign Relations in New York. "We'll see by their actions," Blinken said of the future relationship, calling on Iran to choose to "not take actions that further escalate the tensions" with the US and in the Middle East.

... Diplomats, however, say indirect talks have quietly resumed in recent months with Oman as an intermediary, with the focus largely on the status of U.S. prisoners in Iran. The talks on restoring the 2015 nuclear accord broke down over disputes on the extent of relief from sweeping U.S. sanctions imposed by Trump and over when Iran would return to compliance by pulling back from countermeasures taken in response to the U.S. withdrawal from the deal. Blinken said the Biden administration had made a "good-faith effort" with European powers as well as rivals China and Russia to return and that for a time "that looked possible." "Iran either couldn't or wouldn't do what was necessary to get back into compliance," he said.

Source: https://www.voanews.com/a/blinken-says-no-nuclear-deal-on-table-with-iran/7158920.html, 28 June 2023.

NUCLEAR DISARMAMENT

BRAZIL–INDONESIA

Brazil and Indonesia Likely to Ratify TPNW Soon

The TPNW was adopted at the UN headquarters in New York six years ago, on 7 July 2017, with the backing of 122 countries, and entered into force in 2021. It is the first comprehensive, globally applicable prohibition on the use and possession of nuclear weapons, as well as the first multilateral framework for eliminating nuclear weapon programmes and addressing the ongoing harm from past nuclear tests.

When the treaty opened for signature on 20 September 2017, the then-president of Brazil, Michel Temer, was the first world leader to sign it. He described it as "a historic moment". A year later, he submitted the treaty to the Brazilian national congress for ratification. But lawmakers failed to take any further action between 2019 and 2022, under the presidency of Jair Bolsonaro.

The ratification process now appears to be back on track. Brazil's new president, Luiz Inácio Lula da Silva, said during a G7 summit in Hiroshima, Japan, in May 2023: "As long as nuclear weapons exist, there will always be the possibility of their use. It was for this reason that Brazil was actively engaged in the negotiations of the [TPNW], which we hope to be able to ratify soon." The foreign affairs and national defence committee of the chamber of deputies – the lower house of the federal congress – is currently preparing a report on the TPNW, after which it will be sent to the federal senate for final review. As a member of a core group of states that instigated the treaty-making process, Brazil was instrumental in the TPNW's creation in 2017. It has described the treaty as "the most important international agreement negotiated in the field of disarmament in recent years" and "an evolutionary leap for the disarmament and non-proliferation regime".

Brazil's new president, Luiz Inácio Lula da Silva, said during a G7 summit in Hiroshima, Japan, in May 2023: "As long as nuclear weapons exist, there will always be the possibility of their use. It was for this reason that Brazil was actively engaged in the negotiations of the [TPNW], which we hope to be able to ratify soon.

Like Brazil, Indonesia is also poised to complete its TPNW ratification process in the coming months. The Indonesian president, Widodo, submitted the treaty to the lower house of the national legislature last October. A parliamentary commission on foreign affairs and defence is now examining it and has conducted hearings with

academics and government officials. In February, Indonesia's foreign minister, Retno Marsudi, said that "Indonesia is currently finalising the ratification process [for the TPNW], and expects other countries to ratify it soon". It "has already established supportive laws and regulations to accommodate the treaty into our national regulation system".

In 2021, Indonesia described the TPNW's entry into force as "a very important milestone", providing a "legal framework to delegitimise nuclear weapons" and raising "moral barriers against their threat". It called on "countries that have not signed the treaty to do so and be part of the positive force towards global nuclear disarmament.

In 2021, Indonesia described the TPNW's entry into force as "a very important milestone", providing a "legal framework to delegitimise nuclear weapons" and raising "moral barriers against their threat". It called on "countries that have not signed the treaty to do so and be part of the positive force towards global nuclear disarmament". Sixty-eight states are parties to the TPNW, having ratified or acceded to it. A further 27 have signed but not yet ratified it, including Brazil and Indonesia. Currently the largest parties by population are Nigeria, Bangladesh, Mexico, the Philippines, Vietnam, and the Democratic Republic of the Congo. Close to half of the world's countries will soon be counted as either parties or signatories.

Source: https://www.icanw.org/brazil_ and_ indonesia_likely_to_ratify_tpnw_soon, 07 July 2023.

GENERAL

Nagasaki to Take Shot at G-7 over its Nuclear Deterrence Stance

Nagasaki's annual peace declaration this summer is expected to take issue with a nuclear disarmament document adopted at the Group of Seven summit held in Hiroshima in May for trying to maintain nuclear deterrence. In doing so, it will reflect the critical voices of "hibakusha" atomic bomb survivors. On July 8 the city presented a preliminary draft of the declaration to the third meeting of the drafting committee, which is comprised of 15 members, including scholars and hibakusha.

The G-7 Leaders' Hiroshima Vision on Nuclear Disarmament states: "Our security policies are based on the understanding that nuclear weapons, for as long as they exist, should serve defensive purposes, deter aggression and prevent war and coercion." The preliminary draft gives high marks to the G-7 leaders' "commitment" in the document "to achieving a world without nuclear weapons.

Mayor Shiro Suzuki will read the declaration during a ceremony on Aug. 9 to mark the 78th anniversary of the city's 1945 atomic bombing. The G-7 Leaders' Hiroshima Vision on Nuclear Disarmament states: "Our security policies are based on the understanding that nuclear weapons, for as long as they exist, should serve defensive purposes, deter aggression and prevent war and coercion." The preliminary draft gives high marks to the G-7 leaders' "commitment" in the document "to achieving a world without nuclear weapons." However, Shigemitsu Tanaka, 82, who heads the Nagasaki Atomic Bomb Survivors Council, said at the second meeting of the drafting committee on June 17 that the Hiroshima Vision "justified" the argument for nuclear deterrence. He called on city authorities to revise an earlier draft to echo the low regard hibakusha atomic bomb survivors have for the G-7 document.

Overall, the preliminary draft sounds the alarm about the horrors of nuclear warfare because Russia continues to threaten to use nuclear weapons in its war in Ukraine and other countries are becoming more dependent on nuclear arms. It also states that Suzuki's parents are both atomic bomb survivors and includes a commitment to

pass down the feelings and experiences of hibakusha to the next generation. Suzuki, 55, was elected mayor in April. He will read the peace declaration for the first time during the annual peace memorial ceremony this year. Nagasaki city expects to compile a draft outline of the peace declaration by the end of July after gauging opinions about the preliminary draft.

The strategy makes two key recommendations to address gaps in long-term waste disposal plans. Firstly, it recommends intermediate-level and non-fuel, high-level waste be disposed of in a deep geological repository with implementation by NWMO. This recommendation would include a consent-based siting process. Secondly, it recommends that low-level waste be disposed of in multiple, near-surface disposal facilities, managed by waste generators and waste owners.

Source: https://www.asahi.com/ajw/articles/14952502, 09 July 2023.

NUCLEAR WASTE MANAGEMENT

CANADA

NWMO Makes Recommendations on Canada's Waste Plans

Canada's Nuclear Waste Management Organization (NWMO) has submitted recommendations to the country's Minister of Natural Resources, Jonathan Wilkinson, for an Integrated Strategy for Radioactive Waste. In late 2020, the minister asked NWMO to lead a dialogue to develop the strategy. While the majority of Canada's radioactive waste has long-term disposal plans, there are gaps - particularly with some low, intermediate and non-fuel, high-level wastes. These wastes are currently safely stored at licensed interim facilities.

In November 2020, then Minister of Natural Resources Seamus O'Regan requested NWMO - a not-for-profit organisation which is responsible under Canadian law for the long-term management of the nation's used nuclear fuel - to lead a dialogue to develop an integrated strategy for all Canada's radioactive waste through close collaboration among waste owners and producers, Indigenous peoples and other interested Canadians. The engagement phase ran until the end of March 2021. A draft strategy was released for public comment in late 2022. Since then, refinements have been made in consideration of public feedback and to strengthen alignment with Canada's policy for radioactive waste and decommissioning, which was published by Natural Resources Canada on 31 March this year.

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The strategy includes four principles to support effective implementation of these recommendations. Consent of the local communities and Indigenous peoples in whose territory future facilities will be planned must be obtained through the siting process. The design of facilities should prioritise the protection of water. Long-term "caretaking" should be established for disposal facilities. The strategy states that action must be taken now to deal with these wastes and not left for future generations.
...

Source: https://world-nuclear-news.org/Articles/NWMO-makes-recommendations-on-Canada-s-waste-plans, 10 July 2023.

CROATIA

IAEA Sees Croatian Commitment to Radwaste Management

The IAEA sent an Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (Artemis) mission to Croatia at the request of the

government. Artemis missions provide independent expert opinion and advice, drawn from an international team of specialists convened by the IAEA. Reviews are based on IAEA safety standards and technical guidance, as well as international good practices. A team - comprising five experts from Canada, France, Norway, Sweden and the UK, as well as three IAEA staff members – completed a nine-day mission on 19 June.

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An observer from the European Commission also attended the mission. The mission was hosted by the Croatian Fund for Financing the Decommissioning of the Krško Nuclear Power Plant. The Artemis review evaluated Croatia's national framework, strategy and national programme for fulfilling the country's obligations for safe and sustainable management of used fuel and radioactive waste. The Artemis review gave special emphasis to the plans for the management of radioactive waste from the Krško plant and the plans for the establishment of a Radioactive Waste Management Centre at Èerkezovac in Croatia.

The Artemis review team identified recommendations and suggestions to improve the management of radioactive waste in Croatia, including: providing clarity and consistency on the roles of the relevant organisations, on planning assumptions and on programme milestones to facilitate communication and decision making; providing arrangements for the safe and secure centralised storage of institutional waste in Croatia; developing guidance stating regulatory expectations for safety assessments to support authorisation of radioactive waste storage and disposal facilities; and addressing the human resource needs of the regulatory body and the fund.

In its review, the Artemis review team considered the findings from previous IAEA Integrated Regulatory Review Service reviews in 2015 and 2019. The 696 MWe Krško plant is a Westinghouse pressurised water reactor located on the Sava river. It is unusual in being jointly owned by two countries: Slovenia, where it is located, and Croatia, both of which were parts of the former Yugoslavia when Krško came online in 1981.

Used nuclear fuel from the Krško plant is initially stored at the plant. After storage, the fuel will be disposed of in a geological disposal facility which is planned to be developed at a location in Croatia or Slovenia. Low and intermediate-level waste from Krško is initially stored at the plant. There are plans to transfer half of this waste to Croatia, where it will be stored at the Radioactive Waste Management Centre at Èerkezovac. This facility will also receive radioactive waste, including disused sealed radioactive sources from medicine, industry, agriculture, research and education in Croatia. These are currently being kept at the locations where the sources were used.

Waste which will be stored at the planned Radioactive Waste Management Centre at Èerkezovac will later be disposed of at facilities which are to be developed in Croatia. "Croatia has several of the necessary elements in place for a national programme for managing radioactive waste including stable financing arrangements," said Artemis team leader, Amélie de Hoyos, Safety of Radioactive Waste Disposal Engineer at France's Institute for Radiological Protection and Nuclear Safety. ...

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Source: https://www.world-nuclear-news.org/Articles/IAEA-finds-Croatian-commitment-to-radwaste-managem, 26 June 2023.

GENERAL

Addressing the Nuclear Waste Challenge with Gen IV Reactor Technology

The issue of nuclear waste management has long been a significant challenge for the nuclear power industry. With the increasing demand for clean and reliable energy sources, nuclear power has emerged as a viable alternative to fossil fuels. However, the safe and effective disposal of nuclear waste remains a critical concern for policymakers, industry stakeholders, and the public. In response to this challenge, the development of Gen IV nuclear reactor technology offers a promising solution to the nuclear waste problem.

Gen IV reactors are a new generation of advanced nuclear power systems designed to address the shortcomings of current reactor technologies. These reactors are characterized by improved safety features, enhanced efficiency, and reduced environmental impact. One of the most significant advantages of Gen IV reactors is their ability to consume nuclear waste as fuel, effectively reducing the volume and toxicity of nuclear waste generated by the power industry.

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The concept of using nuclear waste as fuel is not new, but Gen IV reactors have the potential to take this idea to new heights. Traditional nuclear reactors use uranium or plutonium as fuel, producing a mix of radioactive isotopes as waste products. These isotopes can remain hazardous for thousands of years, necessitating long-term storage and disposal solutions. Gen IV reactors, on the other hand, can utilize a broader range of fuel types, including spent nuclear fuel and other nuclear waste materials. By recycling nuclear waste, Gen IV reactors can significantly reduce the amount of long-lived radioactive waste that must be managed and stored.

One example of a Gen IV reactor design that can consume nuclear waste is the Integral Fast Reactor (IFR). The IFR is a sodium-cooled fast breeder reactor that can use a wide variety of fuel types, including spent nuclear fuel and weapons-grade plutonium. The IFR's unique design allows it to burn nuclear waste while generating electricity, effectively reducing the volume and toxicity of nuclear waste.

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Another promising Gen IV reactor design is the Molten Salt Reactor (MSR). The MSR uses a liquid mixture of salts as both fuel and coolant, enabling it to operate at higher temperatures and lower pressures than traditional reactors. This design allows the MSR to achieve higher thermal efficiency and generate less waste. Furthermore, the MSR can be configured to consume nuclear waste, including long-lived isotopes that are difficult to manage in conventional disposal methods.

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The development and deployment of Gen IV reactors could have a profound impact on the nuclear waste challenge. By recycling nuclear waste and reducing the volume and toxicity of waste products, these advanced reactor designs can help alleviate concerns about long-term storage and disposal. Additionally, the improved safety features and enhanced efficiency of Gen IV reactors can make nuclear power a more attractive option for meeting global energy demands. However, the widespread adoption of Gen IV reactor technology faces several challenges. The development of these advanced reactors requires significant investment in research and development, as well as the establishment of regulatory frameworks to ensure their safe operation. Additionally, public perception of nuclear power and concerns about safety and waste management may hinder the acceptance of Gen IV reactors.

Gen IV reactor technology offers a promising solution to the nuclear waste challenge by recycling waste and reducing its volume and toxicity. The development and deployment of these advanced reactors could help address concerns about nuclear waste management and contribute to a cleaner, more sustainable energy future.

In conclusion, Gen IV reactor technology offers a promising solution to the nuclear waste challenge by recycling waste and reducing its volume and toxicity. The development and deployment of these advanced reactors could help address concerns about nuclear waste management and contribute to a cleaner, more sustainable energy future. However, overcoming the challenges associated with the adoption of Gen IV reactor technology will require collaboration between policymakers, industry stakeholders, and the public to ensure that these innovative solutions can be safely and effectively implemented.

Source: https://www.energyportal.eu/news/addressing-the-nuclear-waste-challenge-with-gen-iv-reactor-technology/37915/, 25 June 2023.

UK

Studies Underway to Find Sites for Underground Nuclear Waste Storage Facilities

Government organisation Nuclear Waste Services has commenced studies to assess potential sites for suitability to host nuclear waste storage facilities. Known as a geological disposal facility (GDF), it will see the creation of underground vaults and tunnels in which to store the radioactive waste from nuclear power stations. Currently the UK's higher activity radioactive waste is contained in surface stores at various sites, including Sellafield, Magnox and Dounreay. These surface-based stores are relatively simple structures, built to contain the waste for at least 100 years. These are relatively short-term and costly solutions.

The GDF programme has been developed as a solution that will dispose of the waste while ending the liability for future generations. Unlike the surface storage facilities, GDFs will be closed, remediated, have all surface facilities removed and then be sealed forever. The waste will then decay to harmless material over the course of thousands of years. The on-site studies for GDFs will be carried out over a number of years to ensure that a facility can be constructed, operated

and sealed with safety and security. The sites will be assessed on factors including safety and security, community, environment, engineering feasibility, transport, geology and value for money.

The initial evaluations of the community partnership areas will see Nuclear Waste Services experts and specialists from the supply chain undertaking non-intrusive activities such as geophysical surveys. They will also undertake desk-based studies of existing data on local geology, transport infrastructure, power supply and more. Community partnerships for the potential sites have already formed in Allerdale, South Copeland and Mid Copeland (both in Cumbria) and Theddlethorpe in Lincolnshire. The studies will focus on these areas.

This work will be supported by service providers specialising in data gathering, optioneering and design, assessment, and evaluation. A site evaluation service contract has been awarded setting out a five-year framework of a comprehensive range of site evaluation services. Sites that pass the initial assessments will see more detailed investigative work such as the drilling of boreholes to understand more about the geology deep below the surface, where a GDF would be built. The information gathered from these studies will be key to support the applications to carry out borehole drilling at the locations selected for further work and, pending confirmation of a GDF location, the necessary regulatory permissions. The process of selecting a suitable site could take between 10 and 15 years and a decision to develop a GDF will not be taken until the potential host community has had its say and given consent through a test of public support. ...

Source: https://www.newcivilengineer.com/latest/studies-underway-to-find-sites-for-underground-nuclear-waste-storage-facilities-29-06-2023/, 29 June 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).

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