



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

OPINION – Manpreet Sethi

Pokhran Tests, 25 Years On: India Must Maintain Nuclear Sobriety

On this day 25 years ago, then PM Vajpayee announced that India had conducted three nuclear tests at Pokhran. On May 13, after the conduct of two more tests, he declared, “India is now a nuclear weapon state”. Why did India choose to exercise the nuclear option in 1998 after having followed a policy of ambivalence since conducting a peaceful nuclear explosion (PNE) in 1974? The answer lies in two developments of the 1990s — an increasingly nuclearised neighbourhood; and, a progressively constraining non-proliferation environment.

By the mid-1990s, China had already conducted as many as 45 nuclear tests, developed modest delivery systems, including first-generation nuclear missile-carrying submarines. China had also conducted a nuclear test for Pakistan, reportedly in May 1990, thereby boosting Rawalpindi’s nuclear confidence and emboldening it to foment insurgency in J&K and Punjab. Meanwhile, Washington was pressurising countries to join the NPT as non-nuclear weapon states and the CTBT had been put out for signature. Caught in a security and non-proliferation bind, India felt compelled to develop

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its own nuclear weapons to establish credible deterrence against nuclear coercion or blackmail by countries that claimed Indian territories.

The Indian action took the world by surprise. Criticism and sanctions followed. New Delhi reached out to major capitals to explain its security imperatives. Simultaneously, PM Vajpayee took a bold initiative to reach out to Pakistan. His bus diplomacy in early 1999 led to the signing of the Lahore

Memorandum of Understanding, a forward-looking confidence-building measure between India and Pakistan. But, before it could be

implemented, Pakistan occupied the Kargil heights believing the international community would force India not to escalate and accept the fait accompli. Indian military action and international pressure coerced Pakistan to withdraw.

Meanwhile, the restraint exercised by India led to a grudging change in its image. Soon thereafter, the presentation of a nuclear doctrine in August 1999 further helped India's case. It highlighted a political role for nuclear weapons based on credible minimum deterrence (CMD) and a NFU policy, while concurrently supporting non-proliferation and universal disarmament. In the last quarter century, India has used this doctrinal guidance to build its force structure and posture.

The sole purpose of India's nuclear deterrence is to deter adversaries' use or threat of use of nuclear weapons. As it stands, Pakistan's use of cross-border terrorism and China's territorial incursions at the LAC have continued. Punishment for such attacks has been, and can best be, applied at the conventional level, keeping nuclear weapons out of the equation. Doing so provides India the "space" to employ military force in a manner that makes Pakistan's nuclear threat non-effective. Surgical strikes by India in POK in 2016 and air strikes in Balakot in 2019 are illustrative of this. Similarly, in the case of China's incursions, conjoining conventional operations with the threat of nuclear escalation would raise risks for self, and constrain the scope for conventional responses. To deter aggressive Chinese behaviour, India needs to build adequate infrastructure and military capability in relevant theatres, diplomatically shame China's provocations, forge partnerships, and ensure national economic strength.

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Nuclear India proceeds into adulthood in times of relative nuclear permissiveness. Nuclear-armed states, including in India's neighbourhood, are undertaking arsenal expansion and an offensive and defensive capability build-up. Nuclear brinkmanship is being exercised by advertising an ability to fight "limited" nuclear wars. Such trends necessitate onerous and expensive counterforce nuclear capabilities such as large warhead stockpiles of varied yields, highly accurate nuclear delivery systems for precision targeting, complementary navigation and ISR infrastructure, missile defences as well as counter-BMD capabilities.

India had wisely chosen in 1998 to stay away from such tendencies. It adopted a unique, non-Western philosophy rooted in the basic understanding that nuclear weapons are instruments best suited for deterrence by punishment. The high population densities in Southern Asian cities ensure unacceptable damage with few warheads atop even low-accuracy delivery vehicles. Hence, CMD and NFU were adopted eschewing competition in counterforce capabilities.

In fact, nations that opted to build such forces do not seem to have found much use for them. Despite a large, war-fighting-capable nuclear arsenal, Washington accepted defeat in several regional conflicts. Russia confronts the same dilemma in Ukraine. And, for deterrence, modest capabilities can suffice. New Delhi understood this early in its nuclear journey.

Looking ahead, India needs actions at two levels for sustainable national security. The first is to address immediate security threats by intelligently building sufficient and resilient retaliatory

capability to signal credible deterrence. At the second level, India needs to make long-term innovative diplomatic investments towards the creation of a global environment conducive to peace and universal nuclear disarmament.

The first 25 years of India's tryst with nuclear weapons stand out as a period of restraint, responsibility and maturity. Just as India has made conscious, informed nuclear choices based on a rational understanding of the nature, role, utility and disutility of nuclear weapons, it must maintain nuclear sobriety in the future.

The first 25 years of India's tryst with nuclear weapons stand out as a period of restraint, responsibility and maturity. Just as India has made conscious, informed nuclear choices based on a rational understanding of the nature, role, utility and disutility of nuclear weapons, it must maintain nuclear sobriety in the future. Simultaneously, it can leverage its economic heft, political clout and cultural appeal to showcase the advantages of its philosophy of nuclear deterrence based on minimalism in numbers and restraint in roles and circumstances of use of nuclear weapons. India is the only nuclear-armed state offering this model today.

Source: <https://indianexpress.com/article/opinion/columns/pokhran-tests-25-years-on-india-must-maintain-nuclear-sobriety-8602724/>. May 11, 2023.

OPINION – Madison Hilly

Why I Don't Worry about Nuclear Waste

On a visit to the site of the Fukushima nuclear plant meltdown in Japan in February, Representative Alexandria Ocasio-Cortez of New York did something refreshing: She discussed radiation exposure and nuclear waste without fanning fear. The radiation she got from her visit

Why is nuclear so important for reducing carbon emissions? The countries that have cleaned up their electricity production the fastest have generally done so with hydroelectric power, nuclear, or a combination of the two. The distinct advantage of nuclear is that it requires little land and can reliably produce lots of power regardless of weather, time of day or season. Unlike wind and solar, it can substitute directly for fossil fuels without backup or storage. The International Energy Agency believes it's so crucial that global nuclear capacity must double by 2050 to reach net-zero emissions targets.

— about two chest X-rays' worth — was worth the education she received on the tour, she told her 8.6 million Instagram followers. She then spoke admiringly of France, which, "recycles their waste, increasing the efficiency of their system and reducing the overall amount of radioactive waste to deal with."

Progressive lawmakers, along with environmental groups like the Sierra Club and Natural Resources Defense Council, have historically been against nuclear power — often focusing on the danger, longevity and storage requirements of the radioactive waste. During the 2020 presidential campaign, Senator Bernie Sanders of Vermont said, "It doesn't make a whole lot of sense to me to add more dangerous waste to this country and to the world when we don't know how to get rid of what we have right now." Senator Elizabeth Warren of Massachusetts

echoed these concerns and pledged not to build any new nuclear plants if elected president. So it's no surprise that many Americans believe nuclear waste poses an enormous and terrifying threat. But after talking to engineers, radiation specialists and waste managers, I've come to see this misunderstanding is holding us back from embracing a powerful, clean energy source we need to tackle climate change. We must stop seeing nuclear waste as a dangerous problem and instead recognize it as a safe byproduct of carbon-free power.

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For this reason some U.S. investors, policymakers and even the movie director Oliver Stone are calling for greatly expanding our nuclear capabilities. The Inflation Reduction Act is now rolling out credits for the 54 plants currently in operation and incentives for new ones worth tens of billions of dollars. States across the country are overturning decades-old bans on nuclear construction and exploring investment opportunities. A demonstration project in Wyoming is underway to replace a retiring coal plant with a nuclear reactor. There are many legitimate questions about the future of nuclear — How will we finance new plants? Can we build them on-time and under-budget? — but “what about the waste?” should not be one of them.

Yet because nuclear waste seems to pose an outsize risk in the imaginations of many — especially those who lived through the Cold War — the conversation veers toward permanent solutions, like burying it deep underground in a facility like the proposed Yucca Mountain project in Nevada.

One of our few cultural references to nuclear waste is “The Simpsons,” where it appeared as a glowing green liquid stored in leaky oil drums. In reality, nuclear fuel is made up of shiny metal tubes containing small pellets of uranium oxide. These tubes are gathered into bundles and loaded into the reactor. After five years of making energy, the bundles come out, containing radioactive particles left over from the energy-making reactions. The bundles cool off in a pool of water for another five to 10 years or so. After that, they are placed in steel and concrete containers for

storage at the plant. These casks are designed to last 100 years and to withstand nearly anything — hurricanes, severe floods, extreme temperatures, even missile attacks. To date, there have been no deaths, injuries or serious environmental releases of nuclear waste in casks anywhere. And the waste can be transferred to another cask, extending storage one century at a time.

With this kind of nuclear waste, I'm not referring to water containing the radioisotope tritium that nuclear plants regularly release. Anti-nuclear

activist groups like to scaremonger about this, despite the fact that you'd need to drink over a gallon of the treated water being released from Fukushima to get the equivalent radiation exposure of eating a banana. But what about the spent nuclear fuel — isn't it radioactive for hundreds of thousands of years? The way radiation works, the waste products that are the most radioactive are the shortest-lived, and those that last a long time are far less dangerous. About 40 years after the fuel becomes waste, the heat and radioactivity of the pellets have fallen by over 99 percent. After around 500 years, the waste would have to be broken down and inhaled or ingested to cause significant harm.

Compare this to other hazardous industrial materials we store in less secure ways that don't become less toxic over time. Take ammonia: It is highly toxic, corrosive, explosive and prone to leaking. Hundreds of ammonia-related injuries and even some fatalities have been reported since 2010, and we continue to produce and transport millions of tons of it annually by pipelines, ships and trains for fertilizer and other uses.

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— the conversation veers toward permanent solutions, like burying it deep underground in a facility like the proposed Yucca Mountain project in Nevada. There may be other benefits to consolidating spent fuel in a central facility, but safety is not the primary concern. By failing to construct such a facility, some worry that we're saddling the next generation with the burden of waste management. But as a young person in my 20s expecting a child this year, I feel very comfortable with the way we manage nuclear waste, with making more of it and with passing this responsibility onto our kids. I hope my daughter's generation will inherit many new nuclear plants making clean power — and the waste that comes with them.

The waste should really be a chief selling point for nuclear energy, particularly for those who care about the environment: There's not very much of it, it's easily contained, it becomes safer with time and it can be recycled. And every cask of spent nuclear fuel represents about 2.2 million tons of carbon, according to one estimate, that weren't emitted into the atmosphere from fossil fuels. For me, each cask represents hope for a safer, better future.

Source: <https://silk-news.com/2023/04/28/opinion/opinion-why-i-dont-worry-about-nuclear-waste/>. April 28, 2023.

OPINION – John Bolton

Biden's Half-Hearted Nuclear Deterrence Plan

Last week's summit between President Biden and President Yoon the Republic of Korea had a full agenda, but there is little doubt that Yoon's top

priority was the omnipresent, growing North Korean nuclear threat. Unfortunately, the celebration of the ROK-U.S. alliance's 70th anniversary produced a joint statement, the Washington Declaration, that fell far short of what was necessary. The Declaration's modest measures will not slow Pyongyang's efforts to reunite the Peninsula under its control, so tensions in Northeast Asia will almost certainly continue rising.

Reflecting a growing fear that America's nuclear "extended deterrence" is no longer reliable, either against the North or, importantly, China, South Korean public opinion has increasingly supported an independent nuclear program. Biden's response to Beijing's and Pyongyang's growing nuclear and ballistic-missile threats, embodied in the Declaration, will do little to alleviate these ROK concerns. The most palpable new U.S. commitment to opposing North Korean belligerence is that our nuclear ballistic-missile submarines will, for the first time in 40 years, resume docking, occasionally, in South Korea. Anonymous U.S. officials also predicted there would be a "regular cadence" of visits by aircraft carriers, bombers and more.

Did the White House really believe Pyongyang's leadership thought America's nuclear arsenal was imaginary? Perhaps. It's a strange leadership, with strange ideas, so parading the cold steel from time to time might have an effect, if not on China's Xi Jinping, perhaps on North Korea's Kim Jung Un. Far more likely, however, is that neither Kim nor Xi doubt Washington has massive nuclear assets.

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Instead, ironically but tellingly, they, like South Korea's citizens, think very little of today's U.S. leadership, Republican or Democratic.

China and both Koreas perceive a lack of American resolve and willpower to act decisively when ROK and U.S. national interests are threatened. If so, the Washington Declaration's rhetoric about the U.S. commitment to extended deterrence and strengthening bilateral military ties will be seen as words, and words alone. We are kidding ourselves to believe that having "boomers" pitch up in South Korean waters sporadically will have any deterrent effect.

By contrast, redeploying U.S. tactical nuclear weapons in South Korea, effectively indefinitely, is several orders of magnitude more serious. First, these weapons would remain under sole American control, and immediately available to assist in defending deployed U.S. forces, and their Republic of Korea cohorts. "We go together" (or "katchi kapshida" in Korean) becomes much more than the combined forces' long-standing slogan when backed by battlefield nuclear capabilities. That is far more palpable than submarine port calls.

Second, tactical nuclear deployments would give heft to the Washington Declaration's creation of the Nuclear Coordination Group ("NCG"), charged with strengthening extended deterrence, discussing nuclear planning and managing North Korea's proliferation threat. The new NCG would be far more than just another bureaucratic prop if it had real-world questions like optimizing the deterrent and defensive value of tangible nuclear assets. Lacking concrete responsibilities, how will the new NCG differ from the existing Extended

Deterrence Strategy and Consultation Group, and others, which the Declaration says will be "strengthened"?

Third, while the issue of an independent ROK nuclear capability is politically and militarily separate from returning American tactical nuclear weapons to the Peninsula, renewed deployment would nonetheless buy valuable time for Seoul and Washington to evaluate fully the implications of South Korea becoming a nuclear-weapons state. The presence of American nuclear assets on the Peninsula neither precludes nor renders inevitable a separate ROK program, which has the further advantage of keeping Beijing and Pyongyang guessing.

Moreover, the implicit message weakening the Washington Declaration is that America's antiproliferation efforts to stop Pyongyang from becoming a nuclear power have failed. Consider the proliferation aspect of the NCG's mandate: it is to "manage" the North Korean threat. Not "defeat" that threat, not "eliminate" or "end" that threat, but merely "manage" it.

This is the language of bureaucrats, not statesmen, and it sounds suspiciously like giving up on working to prevent North Korea from becoming able to deliver nuclear payloads. It is therefore appropriate to emphasize that those who opposed taking decisive steps against nuclear proliferators like North Korea and Iran long argued that we had ample time for negotiations. Accordingly, they said, efforts at regime change or pre-emptive military action were over-wrought, premature and unnecessary. Now that Pyongyang has detonated six nuclear devices, and Iran continues to progress toward its first, these same

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people say the rogue states are already nuclear powers, and we must hereafter rely on arms control and deterrence.

In other words, first it was too soon to take decisive action, and now it is too late. One might almost conclude that for all the posturing over the years that North Korean (or Iranian) nuclear weapons were “unacceptable,” that’s not really what many U.S. politicians and policymakers actually believed. They were prepared to accept American failure, but they knew it was impolitic to say it out loud in public.

We are all now at greater risk because of this hypocrisy.

In the Indo-Pacific and the Middle East, where the menace of nuclear proliferation is all too real, others have refused to give up. In his first year in office, for example, Yoon has made improving ROK-Japan relations, badly damaged by his predecessor, a top priority. Better Tokyo-Seoul cooperation is critical to enhanced three-way efforts with Washington, and Yoon’s diplomacy with Japanese PM Kishida is paying dividends.

Kishida will visit South Korea, the first such visit in five years, just before the Hiroshima G-7 meeting, to which Yoon is invited.

It’s obviously easier for Kishida to sell U.S. deployment of tactical nuclear weapons in the South than an independent ROK nuclear force, which would instantly raise in Tokyo the complex question of a comparable Japanese capability. Biden’s half-hearted efforts to enhance U.S. national security should be a significant political vulnerability in the 2024 presidential campaign. It remains to be seen whether

Republicans have the wit to make it an issue.

Source: <https://thehill.com/opinion/national-security/3983161-bidens-half-hearted-nuclear-deterrence-plan/>. May 02, 2023.

OPINION – Umair Irfan

Smaller, Cheaper, Safer: The Next Generation of Nuclear Power, Explained

Inside the Transient Reactor Test Facility, a towering, windowless gray block surrounded by barbed wire, researchers are about to embark on a mission to solve one of humanity’s greatest problems with a tiny device. Next year, they will begin construction on the MARVEL reactor. MARVEL stands for Microreactor Applications Research Validation and Evaluation. It’s a first-of-a-kind nuclear power generator, cooled with liquid metal and producing

100 kilowatts of energy. By 2024, researchers expect MARVEL will be the zero-emissions engine of the world’s first nuclear microgrid here at Idaho National Laboratory (INL). “Micro” and “tiny,” of course, are relative. MARVEL stands 15 feet tall, weighs 2,000 pounds, and can fit in the trailer of a semi-truck. But compared to conventional nuclear power plants, which span acres, produce gigawatts of electricity to power whole states, and can take more than a decade to build, it’s minuscule. For INL, where

scientists have tested dozens of reactors over the decades across an area three-quarters the size of Rhode Island, it’s a radical reimagining of the technology. This reactor design could help overcome the biggest obstacles to nuclear energy:

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safety, efficiency, scale, cost, and competition. MARVEL is an experiment to see how all these pieces could fit together in the real world.

"It's an applications test reactor where we're going to try to figure out how we extract heat and energy from a nuclear reactor and apply it — and combine it with wind and solar and other energy sources," said Yasir Arafat, head of the MARVEL program. The project, however, comes at a time when nuclear power is getting pulled in wildly different directions. Germany just shut down its last nuclear reactors. The US just started up its first new reactor in 30 years. France, the country with the largest share of nuclear energy on its grid, saw its nuclear power output decline to the lowest levels since 1988 last year. Around the world, there are currently 60 nuclear reactors under construction, with 22 in China alone.

But the world is hungrier than ever for energy. Overall electricity demand is growing: Global electricity needs will increase nearly 70 percent by 2050 compared to today's consumption, according to the Energy Information Administration. At the same time, the constraints are getting tighter. Most countries in the world, including the US, have now committed to zeroing out their net impact on the climate by the middle of the century. To meet this energy demand without worsening climate change, the US Energy Department's report on advanced nuclear energy released in March said "the U.S. will need ~550–770 [gigawatts] of additional clean, firm capacity to reach net-zero; nuclear power is one of the few proven options that could deliver this at scale."

The US government is now renewing its bets on nuclear power to produce a steady stream of electricity without emitting greenhouse gases. The Bipartisan Infrastructure Law included \$6 billion to keep existing nuclear power plants running. The Inflation Reduction Act, the US government's largest investment in countering climate change to date, includes a number of provisions to benefit nuclear power, including tax credits for zero-emissions energy. "It's a game changer," said John Wagner, director of INL.

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The tech sector is jumping in, too. In 2021, venture capital firms poured \$3.4 billion into nuclear energy startups. They're also pouring money into even more far-out ideas, like nuclear fusion power. Public opinion has also started moving. An April Gallup poll found that 55 percent of Americans favor and 44 percent oppose using nuclear energy, the highest levels of support in 10 years. But nuclear energy is still facing some long-running headwinds. It's the one power source whose operating costs have actually increased over time. Recent construction efforts have run years behind schedule and billions of dollars over budget. Most reactors still rely on enriched uranium, a pricey fuel to mine and process. Finding a place to store nuclear waste remains a problem. The workforce needed to build and operate plants has withered, due to the decades between reactor builds. And now, with rising interest rates, it's more expensive to finance ambitious energy projects. Can the nuclear energy industry invent its way out of its toughest problems?

Advocates certainly hope so, and the potential for nuclear energy to meet the challenge of climate

change is immense. Many new nuclear power technologies are now in design and testing phases. But one of the most promising strategies for nuclear is to go big by going small. The new generation of nuclear power, explained. Splitting atoms is the largest source of greenhouse gas-free electricity in the US and the second-largest in the world behind hydropower. Nuclear fission produces 10 percent of the world's electricity. The US has the largest nuclear reactor fleet in the world, with 92 reactors across 53 power plants in 28 states. The current crop of nuclear reactors use a variety of different design approaches, tailored to their specific needs. That helped these power plants better fit into the power grids when they were initially built, but it made it harder for them to adapt to changing demands and for newer plants in other places to learn from them.

To understand what sets the new reactor designs apart, it helps to know how earlier designs worked. Generally, civilian nuclear reactors are divided into "generations" that refined the technology, economics, and safety with each iteration. The first generation of reactors were proofs of concept, according to Jess Gehin, associate director for nuclear science and technology at INL. From there, they scaled up in size and added safety features to make them more usable in the real world, forming the second generation. The bulk of the world's operating nuclear reactors right now are second-generation designs. They are also the foundation of most business models and the basis for nuclear energy regulations.

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Fourth-generation reactors are now in the works. Unlike current reactors that mainly use water to control the reaction and to stay cool, these designs use other materials like liquid metal, pressurized gas, and molten salt. The advantage is that they can reach higher operating temperatures, which can lead to greater efficiency. Industrial processes like steel production could also draw on that extra heat.

More recent third-generation reactors advance this with improved safety features. "Several of those have been built that actually start moving away from the active safety systems to more passive systems," Gehin said. The recently opened reactor at the Vogtle Electric Generating Plant in Georgia is a design called AP1000. It's considered a generation three-plus reactor that uses fewer moving parts than conventional designs and can cool off on its own should something go wrong. "You can go 72 hours without any operator interaction," Gehin said.

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Many fourth-generation designs can also use cheaper, lower-grade nuclear fuels. That's one of the approaches being developed by TerraPower, a nuclear company founded by investor Bill Gates. Some fourth-generation designs can even use waste from other reactors. They can also integrate equipment that allows them to ramp up and down more readily to scale with energy demands. These combined effects improve the economics of nuclear power, streamlining the overall process from reducing fuel costs to generating power more effectively to reducing waste and to improving safety.

Nuclear can do more than generate electricity. Some of the most significant advances in nuclear energy, however, may not be in the reactors themselves. Their biggest benefits could come from rethinking how they fit into the existing power infrastructure. The Energy Department has suggested that hundreds of sites for coal power plants, which are rapidly shutting down across the country, could be repurposed for nuclear energy. The advantage is that they already have many of the necessary permits and the equipment to plug into the power grid, saving some of the startup costs of a new plant.

Most conventional reactors are optimized to run flat out, with a steady output of energy. But demand on the power grid varies widely as lights switch on in the evening or heaters turn on during the day. While some nuclear power plants can ramp up and down, it's not always easy. Windy and sunny days can also mean that there's a surfeit of cheap electrons from renewables and undercut nuclear electricity on price. And since nuclear plants have high fixed costs even when they're turned down, they prefer to stay up and sell as much of their electricity as possible. Now, engineers are planning nuclear reactors with this capricious demand in mind. "New reactors are designed to be dispatchable and flexible," said Christine King, director of the Gateway for Accelerated Innovation in Nuclear at INL.

One idea is to integrate energy storage. Molten salt, for instance, can be used to store heat from

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So as engineers come up with new ways to split atoms, nuclear observers also have to come up with new standards to make sure they're safe. The back-and-forth between developers and regulators adds another layer of complexity to the design process. And anytime there's a problem with a nuclear power plant anywhere, regulators step up their scrutiny.

a nuclear reactor for hours at a time and dispatch it as needed. Another approach is to use the heat from a reactor not just to boil water but to provide industrial heat to factories. Researchers are also designing reactors that can produce hydrogen when they have excess power, which in turn can run fuel cells in cars or put electrons back on the grid.

Electricity from nuclear power plants doesn't necessarily have to feed into the power grid either, according to King. It can instead power dedicated

processes like capturing carbon dioxide directly from the air. Capturing this carbon dioxide is a highly energy-intensive process, though, and nuclear could provide the requisite power without making the problem worse. That captured carbon

could then serve as a building block for synthetic fuels, particularly for sectors that are hard to electrify, like aviation and shipping. It's hard to build anything these days. The virtues of advanced nuclear reactors are all great in theory. In practice, building anything big is really, really hard.

Bent Flyvbjerg, a professor at the IT University of Copenhagen and a professor at the University of Oxford, recently co-authored a book called *How Big Things Get Done*. It examines why so many major infrastructure projects like high-speed trains, IT systems, and even home renovations run behind schedule and over budget. Often, these problems arise from a failure of planning, inadequate expertise, political pressure, and limited experience.

Nuclear energy brings even more unique challenges. One is that the technology itself is evolving, so it's difficult to learn from past efforts to build reactors. Nuclear regulators also built their rules around second-generation designs. So as engineers come up with new ways to split atoms, nuclear observers also have to come up with new standards to make sure they're safe. The back-and-forth between developers and regulators adds another layer of complexity to the design process. And anytime there's a problem with a nuclear power plant anywhere, regulators step up their scrutiny. "Once they had adapted to a certain set of standards, they would be raised because there was a nuclear incident or accident," Flyvbjerg said.

Most existing commercial reactors also don't scale up and down easily, so they have to start with bigger, more expensive designs at the outset. That means they have to recover that cost over decades, but if utilities get their electricity demand forecasts wrong, then nuclear power plants end up having to raise their prices or lose money. With new reactors being built for the first time, there's little experience to draw on. Builders often encounter unanticipated problems that require more money and resources to fix.

The Vogtle Plant was nearly six years behind schedule, and its cost was almost double its initial budget of \$14 billion, for example. Utilities in South Carolina abandoned a \$9 billion effort to build two AP1000 reactors in 2017. If you're an investor or a public utility, it's enough to grind your molars into dust. Developing fourth-generation reactors stands to be an even more expensive, time-consuming process. But there are some potential ways to chip away at these monumental challenges. One way is for

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Canadian PM Trudeau said in April that Canada is making "a return to nuclear, which we're very very serious about, and investing in some of the small modular reactors." One of NuScale's first commercial SMR plants in the world is now planned in Romania in 2028.

governments to step in and provide research support to these new designs and test them out.

For the nuclear industry, the hot new strategy is to scale down with small modular reactors, or SMRs. Rather than building huge, customized reactors on site, companies like NuScale are developing smaller reactors, on the order of 10 to 50 megawatts, that can be built in factories and trucked or shipped around the world. The standardized designs could save costs. And by starting small and scaling up, they could meet a variety of use cases.

This approach has already caught eyes around the world. The US Navy already operates more than 200 small nuclear reactors to power submarines and aircraft carriers. The test is to see whether the business case makes sense on land. China and Russia are already running SMRs, and 19 countries are developing them. Canadian PM Trudeau said in April that Canada is making "a return to nuclear, which we're very very serious about, and investing in some of the small modular

reactors." One of NuScale's first commercial SMR plants in the world is now planned in Romania in 2028. "This is the right experiment to be doing," Flyvbjerg said.

And with designs like MARVEL, researchers are investigating even smaller

reactors that can power remote communities, back up renewables, or provide emergency power after a disaster. As reactors get smaller, though, the question is how many it will take in order to achieve economies of scale. "A lot of learning has to do with how many you build," said Gregory Nemet, a professor at the University of Wisconsin Madison and author of *How Solar Energy Became Cheap*.

Technologies like wind turbines, photovoltaic

panels, and lithium-ion batteries saw huge price drops in part because it was easy to build a lot of them, so small improvements in performance had big ripple effects. If smaller nuclear reactors could achieve even a fraction of these cost declines, they could finally push the cost curve of nuclear power in the other direction. It's not clear how much advanced nuclear will cost. Balancing the books may prove to be a bigger obstacle for nuclear power than splitting the atom.

A new report from the National Academy of Engineering says the economics of nuclear power "is perhaps the largest challenge to the commercial success of advanced reactors." Advanced nuclear reactors are especially tricky to game out. "Let me just say that anyone making estimates of what it will cost to produce electricity from these power plants has got to have a whole series of embedded assumptions, there's a lot of uncertainty," said Richard Meserve, a former chair of the nuclear regulatory commission and a co-author of the report, during a briefing about the report.

Another big issue is that most countries still don't have a long-term solution for dealing with nuclear waste, which can remain hazardous for hundreds of years. It's a huge technical and political problem. And while there is more demand for clean energy, interest rates are rising, making it more expensive to borrow money to build anything, let alone financially risky novel reactors. INL's Wagner noted that US reactor construction halted in the '80s due in part to high interest rates at the time. "When interest rates go to 10, 12, 15 percent, what happens? You've got cost overruns," he said. At the same time, the world is about to overrun its carbon budget and overshoot the goal of limiting warming to less than 2.7 degrees Fahrenheit (1.5 degrees Celsius) this century.

The US has now committed to cutting its greenhouse gas emissions in half by 2030 compared to 2005 levels. It's unlikely that new nuclear power plants will make much progress toward that goal, now less than seven

years away. But the US and more than 130 countries in the world want to eliminate their contributions to climate change entirely by 2050. That goal demands far cleaner, more abundant, and reliable energy than we have now. Nuclear could help the world achieve this. It's a risky and expensive investment, but the foundations for this future have to be laid now.

Source: <https://www.vox.com/science/23702686/nuclear-power-small-modular-reactor-energy-climate-change>. May 01, 2023.

OPINION – Yoshiko Sakurai

Japan is in Dire Need of a Nuclear Strategy

On February 18, North Korea launched a Hwasong-15 ICBM. Then two days later, its "Tactical Nuclear Operational Force" launched two short-range ballistic missiles into the Sea of Japan. The Pyongyang regime characterized both as "launch exercises." If combat-ready Hwasong-15 ballistic missiles with nuclear warheads were deployed, North Korea would become capable of launching strikes on the United States. Likewise, tactical nuclear missiles could target Japan and South Korea.

The US has now committed to cutting its greenhouse gas emissions in half by 2030 compared to 2005 levels. It's unlikely that new nuclear power plants will make much progress toward that goal, now less than seven years away. But the US and more than 130 countries in the world want to eliminate their contributions to climate change entirely by 2050.

Both threats may soon become all too real.

South Korean President Yoon immediately grasped the implications of this crisis. On January 11, he announced that defense of the homeland required either the redeployment of US nuclear weapons in South Korea or the possession of its own nuclear weapons. About 70 percent of South Koreans support the possession of their own nuclear weapons. So does the conservative daily *Chosun Ilbo*, which on February 20 published an editorial that argued that the only viable option is for Seoul to possess its own nuclear weapons. Faced with this crisis, President Yoon has worked to improve bilateral relations with Japan. He was able to bring the fruits of those efforts with him when he met US President Biden at the White House. The two leaders issued the "Washington

Declaration," which pledged to strengthen deterrence against North Korea's nuclear weapons. The two sides also agreed to the establishment of the Nuclear Consultative Group (NCG). It is a permanent consultative group designed to guarantee South Korean participation in the event of an emergency, starting from the stage of US nuclear operational planning.

South Korea Seeks US Pledge:

Both South Korea and Japan are dependent on US nuclear weapons for their security. However, it is only natural that they should be increasingly concerned since the US has refrained from becoming directly militarily involved in the war in Ukraine for fear of Russia's use of nuclear weapons. Washington's vocal emphasis on "extended nuclear deterrence" is no longer sufficient to dispel such fears. President Yoon went to the US-Korea summit meeting determined to secure a firm pledge. The US side publicly pledged among other things that US Navy strategic nuclear submarines equipped with SLBM will visit South Korean ports. It also pledged that the US military will regularly deploy nuclear forces in a manner visible to North Korea. In exchange, South Korea made a commitment to abide by the NPT.

This US-South Korea agreement is already being quickly implemented. On the very day of the US-South Korea summit, the US Navy announced that the Ohio-class nuclear submarine USS Maine was in port at a US military facility in Guam. Port calls at Guam for such a strategic nuclear submarine capable of carrying twenty Trident II SLBM are quite unusual. Moreover, E-6B naval aircraft that

relay missile launch orders and other communications to these submarines also happened to be deployed to Guam at the same time. Yoon's determination to protect his country and his people from North Korea's nuclear threat has led to the decision to allow the first port call by a US nuclear-capable submarine to South Korea since the 1980s — nearly four decades ago.

Learn from NATO: The prestigious magazine *Foreign Affairs* concluded that President Yoon has been "basically correct" in how, after becoming fully awakened to the nuclear

threat from North Korea, he has advocated that South Korea develop its own nuclear weapons. Jennifer Lind is a faculty associate at the Reischauer Institute of Japanese Studies at Harvard University. She recently co-authored an article for *Foreign Affairs* titled "South Korea's Nuclear Options." She argues that the same structure that Europe once faced due to the former Soviet Union's nuclear weapons is now being reproduced in Asia. And therefore, it is only natural that South Korea should want to confirm US intentions. She advises South Korea to learn from the decisions made by NATO. That opinion is applicable to Japan as well. But I have to wonder if PM Kishida really feels a sense of urgency about the nuclear threats posed by North Korea and China.

Nuclear Weapons Sharing: During the 1960s, when Europe was threatened by the Soviet Union, French President Charles De Gaulle asked US President Kennedy whether the United States would really be willing to sacrifice New York City for Paris. Kennedy tried to assure him by pledging that it indeed would. However,

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European leaders were not convinced. Therefore, the US was pressed to deploy a number of tactical nuclear weapons in Europe and create a nuclear weapons-sharing regime with its NATO allies. Professor Lind points out that separate from this arrangement, Great Britain and France had acquired their own nuclear weapons in 1952 and 1960 respectively. In other words, she is saying that South Korea should learn from NATO, which shares control of nuclear weapons while some of its members have also developed their own nuclear weapons. Professor Lind and her coauthor Daryl Press believe that if the US and South Korea cannot deter North Korea's nuclear threat, South Korea may enhance its nuclear capabilities. Or in other words, acquire its own nuclear weapons. They believe that for the most part, the world would understand why Seoul did so.

A Historical Turning Point:

The international community calmly understands that the crisis facing South Korea and Japan is truly this serious. At the beginning of 2023, PM Kishida gave a speech at the John Hopkins School of Advanced International Studies (SAIS). There, he referred to the three documents related to a security policy adopted by the Cabinet in December 2022. Kishida declared that collectively, they represented a "major shift in Japan's postwar security policy." Furthermore, he lauded the decision to adopt the documents, saying it represents one of the most historically critical milestones in Japan's defense stance. He also cited the precedents set by the three former PMs Shigeru Yoshida, Nobusuke Kishi, and Shinzo Abe. So far, so good. I also greatly value the three security documents.

Nonetheless, as the PM noted in his speech,

Professor Lind points out that separate from this arrangement, Great Britain and France had acquired their own nuclear weapons in 1952 and 1960 respectively. In other words, she is saying that South Korea should learn from NATO, which shares control of nuclear weapons while some of its members have also developed their own nuclear weapons.

In the fall of 2022, the US Department of Defense released a Nuclear Posture Review (NPR). It states that by the 2030s, the US will for the first time in history "face two major nuclear powers as strategic competitors and potential adversaries." The Pentagon also forecasts that by 2035 China will have 1,500 nuclear warheads.

we are now at a historical turning point. And North Korea is not the only problem. In March 2023, Russian President Putin rejected mutual inspections of nuclear warheads and missiles, as stipulated by the New START between the US and Russia. Meanwhile, the conflict in Ukraine rages on. Putin flippantly dismissed them "as some kind of theater of the absurd." With the New START Treaty due to expire in 2026, the nuclear force buildup will likely gain momentum.

China's Nuclear Buildup:

Determined like Russia to force a major historical shift and eager to construct a world order to Beijing's liking is Chinese President Xi. One of his most important means for accomplishing this ultimate goal is nuclear buildup, the last thing we need at this time. On January 26, the chairman of the US Strategic Command sent a letter to the Senate and House Armed Forces Committees. It informed them that the "number of land-based fixed and mobile ICBM launchers in China now exceeds the number of ICBM launchers in the United States." In the fall of 2022, the US Department of Defense released a Nuclear Posture Review (NPR). It states that by the 2030s, the US will for the first time in history "face two major nuclear powers as strategic competitors and potential adversaries." The Pentagon also forecasts that by 2035 China will have 1,500 nuclear warheads.

Japan is Lagging Behind: The threat that China poses to Japan is of a different order entirely from that of North Korea. Despite this situation, the three security-related documents make no mention of Japan's establishment of a nuclear strategy. Maintaining defense spending at two percent of GDP, I daresay, is not a strategy, but simply a tactic. In the current rapidly changing

security environment, PM Kishida's security policy is quickly being left behind. Having taken one step with the three security documents, the PM must now take the next step. The G7 Hiroshima Summit will begin on May 19. And it is due to discuss the nuclear strategy that forms the foundation of the free world's security.

Isn't it the PM's responsibility to speak proactively about the possible role that Japan can play? Kishida must address the issues involved from the perspective of Japan, exposed as it is on the front line of China's nuclear capability buildup. He needs to frankly discuss concrete measures for nuclear deterrence vis-a-vis China. Furthermore, and even more to the point, we must not forget for a moment that the Kishida administration has publicly pledged to work toward revising the Constitution.

Source: <https://japan-forward.com/japan-is-in-dire-need-of-a-nuclear-strategy/>. May 07, 2023.

NUCLEAR STRATEGY

RUSSIA

US Intel Chief: Russia 'Very Unlikely' to Use Nuclear Weapons

Russia is very unlikely to use its nuclear weapons, the top US intelligence official said, suggesting restraint by Moscow even as it takes heavy casualties in the war in Ukraine. "It's very unlikely, is our current assessment," Director of National Intelligence Avril Haines told the Senate Armed Services Committee

Source: <https://www.malaymail.com/news/world/2023/05/04/us-intel-chief-russia-very-unlikely-to-use-nuclear-weapons/67696>. May 04, 2023.

USA-SOUTH KOREA

US-South Korea Nuclear Weapons Deal – What You Need to Know

What is in the 'Washington Declaration'? Well, there's strong language. Whereas the U.S. has repeatedly "reaffirmed" its commitment in the past to the defense of South Korea, the wording in the Washington Declaration is more robust. It

builds on the language contained in the joint statement released during Biden's visit to Seoul soon after Yoon assumed office in May 2022. On that occasion, the U.S. pledged its "extended deterrence commitment to the (Republic of Korea) using the full range of U.S. defense capabilities, including nuclear, conventional and missile defense capabilities." This time, lest there be doubt, that affirmation is made "in the strongest words possible."

But what does that mean in real terms? First, the U.S. "commits to make every effort to consult with the (Republic of Korea) on any possible nuclear weapons employment on the Korean Peninsula." More substantively, the two sides commit "to engage in deeper, cooperative decision-making on nuclear deterrence," including through "enhanced dialogue and information sharing regarding growing nuclear threats" to South Korea. It will come as a welcome development to decision-makers in South Korea, although it raises questions about just how much intel on North Korea's threat and capabilities the U.S. – and Japan, with its advanced signal intelligence systems – did not share with previous administrations in Seoul.

Second, the two allies will establish a new nuclear consultative group to "strengthen extended deterrence, discuss nuclear and strategic planning and manage" the growing threat posed by Pyongyang. This means Seoul now will have a seat at the table when it comes to planning any nuclear response strategy and in readying its "conventional support to U.S. nuclear operations in a contingency." In sum, Seoul will now have a much greater say in intel-sharing and planning for a joint long-term nuclear strategy, with a focus on its own role in any future flare-up in the Korean Peninsula.

Why are the US and South Korea Announcing this Now? The international security environment has drastically changed over the past year, necessitating credible countermeasures from the two allies, in cooperation with Japan. North Korea has fired well over 100 missiles since January 2022. Meanwhile, Russia's invasion of Ukraine and its

many alleged war crimes have only pulled China and North Korea closer into its sphere. And China has gone beyond its usual “wolf-warrior diplomacy” rhetoric by conducting threatening military drills around Taiwan last August and, again, this April. The Washington Declaration comes on the 70th anniversary of the alliance between Washington and Seoul. The timing serves as an opportunity to reflect on and reassess the relationship. But, no doubt, the main drivers in this strongly worded reaffirmation of the alliance are the recent actions taken by the governments in Pyongyang, Moscow and Beijing.

How has South Korea’s Position on Nuclear Options Evolved?

The Korean Peninsula has been through two periods of actual “denuclearization” since the 1953 armistice that ended combat during the Korean War. The first was in the 1970s when the U.S., catching wind of South Korea’s secret nuclear weapons program, threatened to withdraw all U.S. troops from the South unless Seoul completely dismantled the program. And, so, the government abandoned its nuclear ambitions. The second came in 1991 when the U.S. and South Korea – perhaps anticipating the coming collapse of the Soviet empire and a severely debilitated North Korea – agreed to withdraw all U.S. tactical nuclear weapons from the South, even as the North was working on its own nuclear program while vigorously talking “denuclearization.”

But in recent years, public opinion in South Korea has strongly shifted toward self-nuclearization rather than rely on the U.S. stockpile off South Korea’s shores. North Korea’s relentless pursuit of more powerful nuclear and missile capabilities, starting with the resumption of ballistic missiles tests in May 2019 after an 18-month lull, has stiffened views in the South. President Yoon himself floated the idea of self-nuclearization earlier this year. But the

The international security environment has drastically changed over the past year, necessitating credible countermeasures from the two allies, in cooperation with Japan. North Korea has fired well over 100 missiles since January 2022. Meanwhile, Russia’s invasion of Ukraine and its many alleged war crimes have only pulled China and North Korea closer into its sphere.

Washington Declaration appears to have tempered down such sentiment. In it, Yoon “reaffirmed the (Republic of Korea’s) longstanding commitment” to the Nuclear Nonproliferation Treaty, which would prevent the country from building up its own nuclear weapons stockpile.

How will the Declaration Affect Regional Tensions?

A staple of North Korean propagand is that its arms program is a response to U.S. “hostile policy” – which Pyongyang defines as anything from Washington raising concerns about its egregious human rights record to the stationing of U.S. troops in South Korea and joint U.S.-South Korea military drills. As such, it is reasonable to assume that Pyongyang will respond with a threatening act or two in the coming days. Using the Washington Declaration as cover, expect North Korea to embark on another brazen act of defiance.

Last December, Kim Yo Jong, the North Korean leader’s sister and deputy, threatened an intercontinental ballistic missile test on a normal trajectory, rather than the steep angle launches that avoid threatening nearby countries. And in 2017, North Korea’s former foreign minister Ri Yong Ho suggested that Kim Jong Un was considering testing a hydrogen bomb test over the Pacific. Either would represent a ratcheting up of North Korea’s provocations. China, meanwhile, is likely to fall back on its decades-old mantra that issues on the Korean Peninsula need to be resolved “through dialogue” – a position that not only fails to penalize Pyongyang but indirectly empowers the isolationist state.

Source: <https://theconversation.com/us-south-korea-nuclear-weapons-deal-what-you-need-to-know-204604>. April 27, 2023.

Nuclear Politics: The US-South Korea “Washington Declaration”

The US-Republic of Korea alliance began in 1953, at the end of the Korean War. Now 70 years later,

President Biden and Korea's Yoon met to cement and expand the alliance, issuing a Washington Declaration that contains strong expressions of mutual support and severe warnings to Pyongyang in the event of a nuclear attack by North Korea. Both domestic political and alliance considerations drive the Declaration. But two questions must be asked: Are such warnings necessary? Do they add to security on the Korean peninsula?

Nuclear Alliance: On the strategic side, this summit sought to reaffirm US extended deterrence in the event of a North Korean nuclear attack. With Yoon at his side, Biden warned that a North Korean attack would "result in the end of whatever regime" authorized it. Yoon added: "Our two countries have agreed to immediate bilateral presidential consultations in the event of North Korea's nuclear attack and promised to respond swiftly, overwhelmingly and decisively using the full force of the alliance, including the United States' nuclear weapons." The US will regularly deploy nuclear-armed submarines to Korean waters as a demonstration of its commitment. The two countries also agreed to strengthen consultations on nuclear strategy, in particular through "the establishment of a new Nuclear Consultative Group (NCG) to strengthen extended deterrence, discuss nuclear and strategic planning, and manage the threat to the nonproliferation regime posed by the DPRK."

Back to my question: Are such statements and actions necessary to deter North Korea? There is no evidence that the North questions the willingness and ability of the US to respond

devastatingly to a North Korean attack, nuclear or conventional. Nor, despite North Korea's increasing capability to deliver a nuclear weapon to targets in the US, is there reason to think it would do so except in response to being attacked first. Yet, according to numerous reports, some South Koreans are having their doubts about US reliability—enough doubts that around 77 percent of those polled want an independent South Korean nuclear capability. Before visiting Washington, President Yoon himself had raised the possibility of South Korea having its own

nukes, which it surely can produce, and fairly quickly.

The Political Backdrop: Biden's statement was intended to put to rest a South Korean nuclear option or reintroduction of US nuclear weapons to South Korea. (Recall that President Bush ordered their removal in 1991.) That was a win for Biden, especially since the Declaration recommits the ROK to the NPT and to reliance on the US in any scenario that involves use of a nuclear weapon against North Korea. What Yoon got in return was also a win: Biden's commitment on extended deterrence and close consultations on nuclear weapons. The

domestic political motivations for the Washington Statement are clear. Biden probably wanted to quiet accusations in Congress that he is ignoring the North Korean threat. The lavish reception for Yoon and the ensuing declaration may now make North Korea policy less of a target of right-wing criticism.

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tightening the alliance with the US may quiet conservative critics who argue that North Korea's frequent ballistic missile tests require an independent nuclear capability. Continued US control over nuclear weapons on Korean soil doesn't look as reliable to them as it once did. Other Koreans worry about Yoon's close alignment with the US for different reasons: alienation of China, the ROK's top trading partner and major customer for semiconductor exports that Biden wants to restrict; strengthened US defense ties with Japan, despite unresolved issues with South Korea that date to World War II; and pressure that forced Yoon to agree to military aid to Ukraine despite Russia's considerable popularity among the Korean public.

Threats Instead of Diplomacy: Further stoking the fire with talk of nuclear war, the creation of new joint US-ROK planning and coordination groups on nuclear weapons, and another US nuclear-weapon deployment to South Korea may only magnify tensions on the peninsula. Kim Yo Jong, Kim Jong Un's sister, cited the Washington Declaration's threat of total destruction in saying it demonstrated the "most hostile and aggressive will of action" against the North, posing "more serious danger" for regional peace. North Korean military leaders surely noticed reports that the US submarines slated to be deployed to South Korea will be Ohio-class vessels armed with Trident II (D5) ballistic missiles with nuclear warheads.

We can expect still more North Korean missile tests in coming weeks, and quite possibly their long-expected seventh nuclear test. Only in the final sentence of the Declaration do Biden and Yoon address a nonnuclear option: diplomacy. "In parallel, both Presidents remain steadfast in their pursuit of dialogue and diplomacy with the DPRK, without preconditions, as a means to advance the

shared goal of achieving the complete denuclearization of the Korean Peninsula." As I have said many times, the nuclear standoff in Korea requires dedicated, creative diplomacy, not further militarization, if we are to avoid war by accident or miscalculation. Let's not forget: More than 75 million people live in the two Koreas, not to mention more than 28,000 US troops currently stationed there. If there is a nuclear threat, all three countries—not just one—are contributing to it.

Source: <https://www.counterpunch.org/2023/05/08/nuclear-politics-the-us-south-korea-washington-declaration/>. May 08, 2023.

BALLISTIC MISSILE DEFENCE

INDIA

India Successfully Conducts First Test of Naval Ballistic Missile Defence

System

The Indian ambitious BMD system secured success with the first-ever flight test of a unique endo-atmospheric and sea-based interceptor missile from a vessel off the Odisha coast. The Indian Navy and DRDO conducted the maiden trial of a sea-based interceptor missile off the Odisha coast in the Bay of Bengal. Per a statement made by the

The Indian ambitious BMD system secured success with the first-ever flight test of a unique endo-atmospheric and sea-based interceptor missile from a vessel off the Odisha coast. The Indian Navy and DRDO conducted the maiden trial of a sea-based interceptor missile off the Odisha coast in the Bay of Bengal. Per a statement made by the country's defense ministry, the trial aimed to neutralize and engage hostile ballistic missile threats, elevating India into the elite club of countries with Naval BMD capabilities.

country's defense ministry, the trial aimed to neutralize and engage hostile ballistic missile threats, elevating India into the elite club of countries with Naval BMD capabilities. The statement added that before this, DRDO had been able to successfully demonstrate the land-based BMD system with its power for neutralizing ballistic missile threats emerging from adversaries. The defense minister of India, Rajnath Singh, congratulated the Indian Navy and DRDO for achieving this. DRDO's chief, Samir V

Kamat, praised the teams that were involved in the development and design of the missile.

Source: <https://www.marineinsight.com/shipping-news/india-successfully-conducts-first-test-of-naval-ballistic-missile-defence-system/>. April 26, 2023.

UKRAINE

Ukraine Uses US Made Air Defence System to Intercept Russian Ballistic Missile

Ukraine used a U.S.-made air-defense system to intercept a Russian ballistic missile, the first known time that it has been able to block one of Russia's modern missiles. Mykola Oleshchuk, the commander of the Ukrainian Air Force, said in a *Telegram* post that Ukrainian forces were able to take down a Kinzhal, or Kh-47, missile that a MiG-31K aircraft launched from Russia toward the Kyiv region. He said it happened during an attack that Moscow launched on Thursday night. The missile was shot down using the American Patriot defense systems, the first time Ukraine was known to have used the systems. The Kinzhal missile is one of the most advanced Russian weapons and has a range of 2,000 kilometers, according to the Russian military. It is difficult to intercept because it travels at 10 times the speed of sound. It uses hypersonic speed and a heavy warhead to destroy heavily fortified targets including underground bunkers and mountain tunnels. Ukraine first received the Patriot missiles last month after having noted its inability to intercept the Kinzhal missile with its available assets. Germany and the Netherlands have also provided this air defense system to Ukraine.

The missile was shot down using the American Patriot defense systems, the first time Ukraine was known to have used the systems. The Kinzhal missile is one of the most advanced Russian weapons and has a range of 2,000 kilometers, according to the Russian military. It is difficult to intercept because it travels at 10 times the speed of sound.

Ukrainian soldiers have also been trained on how to use the systems to lock onto a target on radar and fire at it. As many as 90 personnel are needed to operate and maintain each battery. Oleshchuk said his daughter reassures neighbors of theirs that when they hear large explosions, they indicate that Ukrainian air defenses are working. He called on civilians to comfort their neighbors during difficult times. Ukrainian Defense Minister Oleksii Reznikov originally asked for the Patriot systems in August 2021, months before Russia launched its full-scale invasion the following February. The successful intercept comes as Ukraine has signaled it is close to launching a counteroffensive to retake territory that Russia has captured during the war.

Source: <https://thehill.com/policy/international/3991771-ukraine-uses-us-made-air-defense-system-to-intercept-russian-ballistic-missile/>. May 06, 2023.

EMERGING TECHNOLOGIES AND DETERRENCE

USA

US Embraces All its Allies to Help it Compete Against China and Russia in Hypersonic Research

Australia's hypersonic space plane is getting a New Zealand ride with the team behind the project hoping its fast enough to catch the Chinese and Russians. Hypersonix Launch Systems is nearing the completion of its first DART-AE drone prototype, and the US subsidiary of NZ-based Rocket Lab is adapting its Electron rocket to boost it to Mach 5 (6125km/h) and beyond.

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and the US subsidiary of NZ-based Rocket Lab is adapting its Electron rocket to boost it to Mach 5 (6125km/h) and beyond. The modified rocket will carry the spacecraft high into the atmosphere at

a sufficient speed for the DART AE to ignite its scramjet engine. From there, the hypersonic prototype will demonstrate its ability to engage in controlled flight at speeds up to Mach 7 (8644km/h) for the United States Defence Innovation Unit (DUI). The mission has a targeted launch date of early next year.

Brisbane-based Hypersonix is one of 63 international aerospace companies contracted by the DUI in a bid to catch up with Chinese and Russian advances in hypersonic technology. The Hypersonic and High-Cadence Airborne Testing Capabilities (HyCAT) project will choose a vehicle capable of sustaining speeds in excess of Mach 5 for at least three minutes to test new technology systems, including communications, navigation, guidance and flight control.

The first Hypersonix prototype will demonstrate the ability of its oxygen-breathing, hydrogen-fuelled, 3D-printed scramjet to shut down and restart multiple times over a 1000km flight. The craft will also carry flight data sensors and recorders to measure the effects of friction and airflow at high speeds. "Our vehicles are capable of non-ballistic flight patterns to at least Mach 7, which exceeds the HyCAT specification," says Hypersonix Launch Systems managing director David Waterhouse. But first, it has to get to Mach 5 for the scramjet to get a "push start".

Source: <https://cosmosmagazine.com/news/hypersonic-research/> April 28, 2023.

DoD Approves Next Step for GPI to Defend Against Hypersonic Missiles

Pentagon overseers have given the Missile Defense Agency the green light to take the next step in developing the Glide Phase Interceptor (GPI), designed to shoot down hypersonic missiles

before they begin the high-speed maneuvers that make them hard to engage, according to a senior MDA official. Laura DeSimone, MDA executive director, told the Potomac Officers Club today that the Missile Defense Executive Board — led by Bill LaPlante, Defense Department acquisition czar, and Heidi Shyu, head of research and engineering — on April 21 signed off on initiation of GPI's "technology development" phase.

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"We have to mature multiple critical technologies to develop and deliver that weapons system, but it's going to give us now the layered defensive approach that we've had for years with ballistic missiles to the hypersonic threat as well,"

DeSimone said. MDA Director Vice Adm. Jon Hill foreshadowed the decision in a March 24 speech, explaining that while work up to now has been focused on modeling and analysis, the next phase of the program would involve building actual hardware.

The GPI program is aimed at knocking down hypersonic missiles during the glide phase of flight when the hypersonic warhead is skimming space before it reenters the atmosphere — the longest phase of flight between launch and "terminal" phase. GPI will include new interceptors as well as modifications to the Aegis Weapon System needed to launch them.

DeSimone elaborated: "Our focus is going to be on maturing those critical technologies. And so those areas right now include the kill vehicle, divert attitude control system, materials, technology, seeker windows. And it's not just the materials, right? We're going to be looking at some development of new

algorithms for the processing of what's coming in through that window."

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The agency has been attempting, without much success, to fast track development due to increasing worry from Pentagon officials and lawmakers about the hypersonic capabilities of China and Russia. Rep. Doug Lamborn, chairman of the House Armed Services' strategic forces subcommittee, grilled Hill about GPI's slow pace during a hearing on April 18. "The administration's proposed budget does not get us even an initial capability for the Glide Phase Interceptor against hypersonics until around 2035. Only in Washington DC does a missile development program take 13 years," Lamborn lamented.

According to one informed source following GPI development closely, lawmakers have been "frustrated" by Defense Department "slow rolling" of the program, with the completion date moving farther away as time has gone by. The planned delivery date "was 2028 several years ago," the source said. In November

2021, the agency announced other transaction agreements to Raytheon, Northrop Grumman and Lockheed Martin to develop concepts for GPI. In June 2022, MDA down-selected Raytheon and Northrop Grumman to move into the next phase under contract modifications worth more than \$41.4 million to continue developing their proposals, working through this February to develop digital prototypes for the hypersonic missile defense system. Today DeSimone said MDA is working to pick up the pace. ...

Source: <https://breakingdefense.com/2023/04/dod-approves-next-step-for-gpi-to-defend-against-hypersonic-missiles/>. April 27, 2023.

NUCLEAR ENERGY

CHINA

IAEA Director General Hails China's Nuclear Energy Efforts to Combat Climate Change

IAEA Director General Grossi delivered a video speech on Wednesday, emphasizing the need for clean and affordable sustainable energy to

combat the most severe climate change. Grossi hailed China's efforts to achieve peak carbon dioxide emissions before 2030 and carbon neutrality by 2060, noting that as the world's largest energy consumer, China has made significant strides in low-carbon development, including the active and orderly development of nuclear energy. He made the remarks at the China Nuclear Energy Sustainable Development Forum which is being held in Beijing from Wednesday to Friday. The theme of the forum is the High-quality development of nuclear energy in the context of carbon peak and neutralization target. According to Grossi, nuclear energy is a crucial component of China's plan to reduce green house gas

emissions, improve energy accessibility and security, and stabilize international energy market prices. Nuclear energy can be deployed on a large scale to achieve these goals.

Grossi said that he has visited over 30 countries with nuclear projects, and

more than 20 countries are implementing nuclear projects. The prospects for nuclear energy development are clear, but decision-making bodies must lay the groundwork for investment in nuclear energy. Public acceptance of nuclear energy is also increasing, according to public opinion polls. To achieve climate goals by 2050, global nuclear capacity must double, meaning existing nuclear power plants must continue to operate and even extend their lifetimes, while new reactors must be continuously commissioned. China has over 30 years of nuclear power development history since the first nuclear power unit was connected to the grid. China currently has 55 operating nuclear power units, ranking first in the world in terms of units under construction. To achieve near-term and long-term climate goals, China has expanded the application of nuclear energy beyond power generation, such as using nuclear energy for regional heating and launching the first industrial heating project.

The IAEA's "Net Zero Emissions" initiative hopes to plan future energy development in each country

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to fully tap the potential of nuclear energy. China's rapid nuclear energy growth, mature technology, and cooperation with multiple nuclear power countries will continue to increase the relevance of international cooperation in the coming years. The nuclear energy industry is becoming increasingly international, especially with the development of SMRs. There are over 80 SMR designs globally, with three already commissioned and many more under construction, Grossi said.

China has developed the high-temperature gas-cooled reactor "Linglong One." For many countries, building large reactors is not practical or economical, so many countries are considering building SMRs. Grossi is pushing for the standardization of design and regulatory coordination of SMRs through the IAEA. China has gained a lot of experience and feedback in international nuclear energy cooperation, especially in the construction of nuclear power plants, as well as the norms and regulations related to nuclear safety and security. These aspects require more standardization and coordination, and the IAEA is working closely with China on these issues, he said.

The IAEA and China have completed several peer review projects together, and China's nuclear safety review mechanism has attracted representatives from more than 50 countries to participate in discussions. Nuclear safety and security are essential for people's well-being and sustainable nuclear energy development. Chinese nuclear safety experts are sharing their experiences with international peers through the IAEA's capacity-building projects. The IAEA and China are continuing their longest-running cooperation project on the management of nuclear waste and radioactive waste, helping to build advanced underground nuclear waste

treatment laboratories in China, Grossi said.

Source: <https://www.globaltimes.cn/page/202304/1289903.shtml>. April 27, 2023.

EGYPT

Construction Begins of Third Unit at Egypt's El Dabaa Nuclear Power Plant

Chairman of Egypt's Nuclear Power Plants Authority (NPPA), Amged El-Wakeel, said: "This past year has witnessed the achievement of many key project milestones including the first concrete pouring for units 1 and 2 and the delivery of the

core catcher for unit 1." He added that the project was "progressing in accordance with the agreed time schedules" and said he was sure "further outstanding achievements will take place with a view of successfully delivering Egypt's first nuclear power plant".

Alexander Korchagin, Senior Vice President for NPP Construction Project

Management at Rosatom's ASE, said: "The start of construction of the third power unit of the El Dabaa NPP indicates that the project is gaining momentum. Last year, work was launched at the first and second power units. Today we are taking another important step. For JSC ASE, the construction of power units under the VVER-1200 project is already a familiar and well-established process, which allows us to fine-tune the process of manufacturing equipment and form the backbone of construction personnel." He added that the El Dabaa NPP construction project "has its own individual characteristics - I thank our Egyptian partners for well-coordinated joint work. Together we will achieve success in the implementation of this grandiose project".

The El Dabaa nuclear power plant project - about 320 kilometres north-west of Cairo - is based on contracts between NPPA and Russia's state nuclear corporation Rosatom that entered into

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force on 11 December 2017. The plant will comprise four VVER-1200 units, like those already in operation at the Leningrad and Novovoronezh plants in Russia, and the Ostrovets plant in Belarus. The contracts stipulate that Rosatom will not only build the plant, but will also supply Russian nuclear fuel for its entire life cycle. They will also assist Egyptian partners in training personnel and plant maintenance for the first 10 years of its operation. Rosatom is also contracted to build a special storage facility and supply containers for storing used nuclear fuel. Korea Hydro & Nuclear Power is constructing 80 buildings and supplying materials for the non-nuclear turbine islands. NPPA applied to the Egyptian Nuclear and Radiological Regulatory Authority for construction licences for units 3 and 4 in January 2022, six months after applying for those of units 1 and 2. Construction of unit 1 began in July last year, with that of unit 2 following in November.

Source: <https://www.world-nuclear-news.org/Articles/Construction-begins-of-third-unit-at-Egypt-s-El-Da>. May 03, 2023.

NETHERLANDS

The Netherlands Considers Nuclear to Reduce Emissions

Many countries around the world are considering how nuclear energy could play a role in reducing CO2 emissions and enhancing energy security. In the Netherlands, decision makers have been searching for ways to diversify and decarbonise their energy supply since the adoption of the 2019 national Climate Agreement, which has led to a transition in their nuclear energy policies. A Nuclear Energy Agency delegation led by Director-General **William D. Magwood, IV** visited the Netherlands to meet with government and industry representatives on the future of the Dutch

nuclear industry. The discussions covered topics including advancements in nuclear technology, development of skills and industrial infrastructure and the preparations required by regulators for a transition in nuclear energy policies. During the mission, Director-General Magwood met with Minister for Climate and Energy Policy **Rob Jetten** to discuss the development and impact of SMRs, with a special overview of the NEA SMR

Dashboard, a new report that helps assess the progress of various SMR technologies. They also delved into the financing of, and government support for, nuclear new build.

Director-General Magwood and NEA Nuclear Strategic Policy Advisor **Michel Berthélemy** visited the TU Delft Reactor Institute (RID), which has been the Dutch knowledge centre for radiation-related research and education for over 50 years. During the visit, they met with **Theun**

Baller, Director of RID at the Technical University of Delft, to discuss the ongoing joint TCOFF projects and the NEA's work in nuclear education, skills and technology capacity building within the NEST Framework. Director-General Magwood was invited to deliver a lecture to a group of PhD students at the institute on the opportunities and challenges of the nuclear sector's resurgence.

Nuclear safety and regulation, a key area of research for the NEA, was the focus of a meeting between Director-General Magwood and the Authority for Nuclear Safety and Radiation Protection (ANVS) Chair, **Annemiek Van Bolhuis**, and Vice-Chair, **Marco Brugmans**. As part of the exchange, they reviewed the benefits ANVS has gained from participating in NEA training programs and discussed the nuclear regulatory preparations required for planned developments in the Dutch nuclear sector. ...

The El Dabaa nuclear power plant project is based on contracts between NPPA and Russia's state nuclear corporation Rosatom that entered into force on 11 December 2017. The plant will comprise four VVER-1200 units, like those already in operation at the Leningrad and Novovoronezh plants in Russia, and the Ostrovets plant in Belarus. The contracts stipulate that Rosatom will not only build the plant, but will also supply Russian nuclear fuel for its entire life cycle. They will also assist Egyptian partners in training personnel and plant maintenance for the first 10 years of its operation.

Director-General Magwood was welcomed by the CEO of research and production organisation NRG | PALLAS, **Bertholt Leeftink**, to their Petten headquarters to discuss developments in the new medical isotopes reactor PALLAS and the NEA's initiatives on SMRs and medical radioisotopes. As part of the visit, they toured the PALLAS Energy and Health Campus.

...Stakeholder engagement and communication is an important area for the NEA, which Director-General Magwood had the opportunity to highlight during a meeting with Minister for the Environment **Vivianne Heijnen**. They discussed how the NEA's work could inform the Netherlands' communication and participation plans with stakeholders, as well as the responsibilities for nuclear safety regulatory affairs and policy actions around nuclear new build plans.

The Netherlands has targets to reduce its carbon emissions by 49% by 2030 and by 95% by 2050. There is one nuclear reactor generating approximately 3% of the country's electricity, and an earlier decision reversed an initial plan to phase out nuclear power plants. The Netherlands has plans to build two new power plants by 2035 that could supply up to 13% of the country's electricity. The NEA looks forward to further supporting the Netherlands as it explores the role that nuclear energy could play in providing energy security while helping to mitigate climate change.

Source: [https://www.oecd-nea.org/jcms/pl_80866/the-netherlands-looks-to-nuclear-](https://www.oecd-nea.org/jcms/pl_80866/the-netherlands-looks-to-nuclear-energy-to-help-reduce-emissions)

energy-to-help-reduce-emissions. April 26, 2023.

TURKEY

Turkey Joins Nuclear Power Club with Akkuyu Plant: Erdogan

Turkey has joined the club of nuclear power countries with the nuclear fuel delivery into the first power unit of the Akkuyu power plant, President Erdogan said. "With the delivery of nuclear fuel by sea and air to our plant, Akkuyu has now acquired the nuclear power plant status. Therefore, our country has risen to the league of countries with nuclear power, albeit after 60 years of delay," Erdogan said at a ceremony via video link, joined by his Russian counterpart Vladimir Putin online. Akkuyu nuclear power plant, Turkey's first nuclear power plant, is being built

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by Russia's state nuclear energy company Rosatom in Mersin province on the southern Mediterranean coastline, reports Xinhua news agency. Erdogan underlined that the power plant is "the biggest joint investment" between Turkey and Russia, and vowed that the Ankara government will take steps to build a second and a third nuclear power plant as soon as possible.

Putin, for his part, hailed the Akkuyu nuclear power plant as one of the most "important partnerships" between the two countries in their history. "This is a

flagship project and it brings both mutual economic benefits and, of course, helps to strengthen the multifaceted partnership between

our two states,” Putin said. Erdogan “personally pays great attention to the expansion of Russian-Turkish relations”, the Russian leader said. A new nuclear industry is being established in Turkey thanks to the Akkuyu Power Plant, Putin said. In 2010, the two countries reached a deal to let Russia’s state company Rosatom build and operate the Akkuyu plant, which is designed with four nuclear reactor units, each with a capacity to generate 1,200 MW of electricity. Under the deal, the Akkuyu plant was to be constructed with a Russian capital of \$20 billion. The construction began in 2018 and is scheduled to complete in 2026. Once fully operational, the plant is expected to produce annually 35 billion kWh of electricity to meet approximately 10 per cent of domestic electricity needs.

Source: <https://www.siasat.com/turkey-joins-nuclear-power-club-with-akkuyu-plant-erdogan-2577925/>. April 28, 2023.

USA

Bill Gates Says New Project is a Nuclear Breakthrough

Bill Gates remains focused on his goals of introducing and supporting sustainable innovation. He has been working on one solution to a piece of the emissions problem for some 15 years — a next-generation nuclear power plant called ‘Natrium.’ The plant, which Gates said could potentially open its doors by 2030, was designed by TerraPower, a company Gates started in 2008. It represents an investment in an energy source that he views as vital in the transition to clean energy production. “The world needs to make a big bet on

nuclear,” Gates wrote in a blog post Friday. “None of the other clean sources are as reliable, and none of the other reliable sources are as clean.”

However, the risks of severe accidents has virtually halted construction in the U.S. Only one U.S. nuclear plant has entered

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service since 2000 and the average age of U.S. plants is about 40 years, according to Energy Information Administration data. The Natrium plant seeks to fix the biggest problems nuclear energy poses. Gates noted the big difference between the Natrium plant and conventional nuclear plants is that the Natrium plant

uses liquid sodium to cool its reactor. Unlike the traditional coolant — water — the liquid sodium can absorb far more heat from the reactor without increasing in pressure, reducing the risk of an explosion. It also continues to cool even if the plant loses power.

The plan also has a unique energy storage system,

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which will make it easier to integrate with power grids. Extensive testing on supercomputers shows the Natrium plant holding up against a variety of simulated disasters. Gates anticipates that the construction of the facility will bring about 1,600 workers to Kemmerer, Wyoming, giving the local economy a big boost for a few years. It will also employ

200-250 people. A local coal plant that is scheduled to be shut down soon employs 110 local residents. “I’m excited about this project because of what it means for the future,” Gates wrote. “It’s the kind of effort that will help America maintain its energy independence. And it will help our country remain a leader in energy innovation worldwide.”

Source: https://www.news-journal.com/arena/thestreet/bill-gates-says-new-project-is-a-nuclear-breakthrough/article_e8025f40-1e8f-5d08-b92c-abef09ba22d6.html. May 05, 2023.

NUCLEAR SECURITY

MALAYSIA-THAILAND

Malaysia and Thailand Host Nuclear Security Technical and Information Exchange Opportunities through IAEA Network

Nigerian nuclear security experts visited Malaysia's national regulatory authority, Atom Malaysia, and other key nuclear institutes to learn about Malaysia's experience in human resource development and technical support programmes. The recent visit marked the post COVID-19 restart of core activities of the IAEA's International Network for Nuclear Security Training and Support Centres (NSSC) Network, which supports Nuclear Security Support Centres to develop new capabilities.

The technical exchange covered many aspects to support the sustainability of Nigeria's national nuclear security regime and its operational implementation, as well as discussions on establishing a coordination mechanism for and resourcing an NSSC. ...The exchange visit highlighted the importance of nuclear security culture, the need for promoting a diversified workforce of well-trained professionals, and for implementing a systematic approach to training.

Launched in 2012, initially with the support of 29 countries, which has now more than doubled, the NSSC Network enhances the work of national NSSCs by promoting international cooperation through connecting

these centres in a community of practice for its members. National NSSCs help foster a culture of nuclear security, by providing training programmes, technical support services for managing the nuclear security equipment lifecycle, and scientific support services for such as providing expertise, analysis, expert advice and support, and research and development. ...The IAEA supports countries interested in establishing an NSSC or improving the effectiveness of an existing centre based on the IAEA's guidance on Establishing and Operating a National Nuclear Security Support Centre and on the identified needs for sustaining a country's national nuclear security regime.

Source: <https://www.iaea.org/newscenter/news/malaysia-and-thailand-host-nuclear-security-technical-and-information-exchange-opportunities-through-iaea-network>. May 08, 2023.

information-exchange-opportunities-through-iaea-network. May 08, 2023.

UKRAINE

IAEA Says Increased Military Activity Underlines Need to Protect Zaporizhzhia

In his latest update on the situation at Europe's largest nuclear power plant, which is on the frontline of the Russian and Ukrainian forces, Grossi said that "increased military presence and activity in the region again underlines the importance and urgency of agreeing on the protection of the plant". He also reported that the latest rotation of staff had taken place - which involves crossing the military front line for both the team arriving, and the team leaving. The IAEA says that its team have been told by the current management of the plant, which has been under Russian military control since early March 2022, that there are now more

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than 3000 staff with Rosatom contracts and “another 1000 in the process of approval. Roughly 1000 staff with Energoatom contracts still work at the plant, and others who remain in Energodar (the nearby town where many staff and family live) are occasionally called to work”.

The update says “the plant management has confirmed that some staff have had their access blocked, claiming it is for ‘security purposes’”, and adds that the director general “has repeatedly expressed deep concern about the extremely difficult situation for ZNPP (Zaporizhzhia nuclear power plant) staff and their families, and the effect it has on nuclear safety and security”. The six-unit nuclear power plant continues to rely on one remaining functioning 750 kV power line for off-site power, although efforts to repair and reinstate a back-up line continue. Since December, the IAEA team has not had access to the nearby thermal power plant through which back-up power has in the past also been provided to the nuclear plant. The update says the IAEA team were told two weeks ago “access would be granted in the coming days”.

“The team observed, and following questions were subsequently informed, that a large piece of equipment being transported into the turbine hall of Unit 3 was a transformer to replace the damaged ‘Kakhovka’ node in the ZNPP open switchyard. The Kakhovka line is one of the four 750 kV lines that were operational before the military conflict. This line is linked to the currently Russian-controlled electrical grid, to the south of the ZNPP site,” the IAEA update said. Since the war began external power has been lost on a number of occasions with the plant having to rely on emergency diesel generators for the power necessary for safety functions. Grossi has spent months speaking to both sides in the conflict seeking agreement on safety and protection measures to reduce the risks to the plant.

Source: <https://www.world-nuclear-news.org/Articles/IAEA-says-increased-military-activity-underlines-n>. April 28, 2023.

USA

USAF Conducts First Nuclear Security Operation with Joint Light Tactical Vehicle

The US Air Force has carried out its inaugural operational mission with the Joint Light Tactical Vehicle (JLTV) for nuclear launch facility maintenance in Harrisburg, Nebraska. JLTVs serve as effective assets for safety and protection across the US military. The US Army and Marine Corps operate the truck for different missions. The

vehicle was introduced as part of US Air Force Global Strike Command efforts to modernize its capabilities and protect the country’s nuclear arsenal. It will eventually replace the service’s aging Humvee. During the recent trial, the air force’s 90th Missile Security Forces Squadron (MSFS) maintenance support team drove the

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JLTVs. “It is built like a tank. When you climb into the Humvee, you are stepping back in time 20 years. The JLTV is like driving the Batmobile into the future to better defend our nation,” squadron Senior Airman Zion Hill stated.

Adjusting to the JLTV: The JLTV’s complexity requires much practice to gain maneuvering skill, the US Air Force said. The training program for the vehicle requires 40 hours of sessions consisting of hands-on familiarization, classroom training, and driving. Airmen who have completed the upskilling will drive the JLTVs around the complex for a couple of weeks once it is rolled out for general use. Meanwhile, Humvee drivers continue to adjust to the new trucks. “Many of the defenders who will operate the vehicle were born after the UAHMMWV entered service and are anxious to take advantage of all the new capabilities,” 90th MSFS Commander Lt. Col. William Brokaw said. “It is a night and day

difference. When you climb inside a Humvee you are walking into a historical box," 90th MSFS Logistics and Sustainment Officer 1st Lt. Joseph Struzik explained. "You will see old analog gauges, a classic steering wheel, a center console with a radio. Whereas, the JLTV gives defenders a better tool to perform their nuclear security duties."

Source: <https://www.thedefensepost.com/2023/04/27/us-joint-light-tactical-nuclear/>. April 27, 2023.

AI Should Never be Able to Launch Nukes, US Legislator Say

Rep. Ted Lieu (D-CA) introduced the Block Nuclear Launch by Autonomous Artificial Intelligence Act alongside Sen. Edward Markey (D-MA) and numerous other bipartisan co-sponsors. The bill's objective is as straightforward as its name: ensuring AI will never have a final say in American nuclear strategy. "While we all try to grapple with the pace at which AI is accelerating, the future of AI and its role in society remains unclear. It is our job as Members of Congress to have responsible foresight when it comes to protecting future generations from potentially devastating consequences," Rep. Lieu said in the bill's announcement, adding, "AI can never be a substitute for human judgment when it comes to launching nuclear weapons."

He's not the only one to think so—a 2021 Human Rights Watch report co-authored by Harvard Law School's International Human Rights Clinic stated that "[r]obots lack the compassion, empathy, mercy, and judgment necessary to treat humans humanely, and they cannot understand the inherent worth of human life." If passed, the bill would legally codify existing Department of

Defense procedures found in its 2022 Nuclear Posture Review, which states that "in all cases, the United States will maintain a human 'in the loop' for all actions critical to informing and executing decisions by the President to initiate and terminate nuclear weapon employment." Additionally, the DOD said that no federal funds could be used to launch nukes by an automated system without "meaningful human control," according to the bill's announcement.

The proposed legislation comes at a time when the power of generative AI, including chatbots like ChatGPT, is increasingly part of the public discourse. But the surreal spectrum between "amusing chatbot responses" and "potential existential threats to humanity" is not lost on Lieu. He certainly never thought part of his civic responsibilities would include crafting legislation to stave off a Skynet scenario, he tells *PopSci*. As a self-described "recovering computer science major," Lieu says he is amazed by what AI programs can now accomplish. "Voice recognition is pretty amazing now. Facial recognition is pretty amazing now, although it is more inaccurate for people with darker skin," he says, referring to long-documented patterns of algorithmic bias.

The past year's release of generative AI programs such as OpenAI's GPT-4, however, is when Lieu began to see the potential for harm. "It's creating information and predicting scenarios," he says of the available tech. "That leads to different concerns, including my view that AI, no matter how smart it gets, should never have operative control of nuclear weapons." Lieu believes it's vital to begin discussing AI regulations to curtail three major consequences: First, the proliferation of misinformation and other

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content “harmful to society.” Second is reining in AI that, while not existentially threatening for humanity, “can still just straight-up kill you.” He references San Francisco’s November 2022 multi-vehicle crash that injured multiple people and was allegedly caused by a Tesla engaged in its controversial Autopilot self-driving mode. “When your cellphone malfunctions, it isn’t going at 50 miles-per-hour,” he says.

Finally, there is the “AI that can destroy the world, literally,” says Lieu. And this is where he believes the Block Nuclear Launch by Autonomous Artificial Intelligence Act can help, at least in some capacity. Essentially, if the bill becomes law, AI systems could still provide analysis and strategic suggestions regarding nuclear events, but ultimate say-so will rest firmly within human hands. Going forward, Lieu says there needs to be a larger regulatory approach to handling AI issues due to the fact Congress “doesn’t have the bandwidth or capacity to regulate AI in every single application.” He’s open to a set of AI risk standards agreed upon by federal agencies, or potentially a separate agency dedicated to generative and future advanced AI. The Biden administration unveiled plans to offer \$140 million in funding to new research centers aimed at monitoring and regulating AI development. When asked if he fears society faces a new “AI arms race,” Lieu concedes it is “certainly a possibility,” but points to the existence of current nuclear treaties. “Yes, there is a nuclear weapons arms race, but it’s not [currently] an all-out arms race. And so it’s possible to not have an all-out AI arms race,” says Lieu. “Countries are looking at this, and hopefully they will get together to say, ‘Here are just some things we are not going to let AI do.’”

Source: <https://www.popsci.com/technology/ted-lieu-ai-nukes/>. May 04, 2023.

NUCLEAR SAFETY

JAPAN

IAEA Assesses Regulatory Preparedness for Fukushima Water Release

It covers the observations of the task force mission to Tokyo from 16 to 20 January 2023 to assess Japan’s Nuclear Regulation Authority (NRA) activities related to the planned discharge. At the Fukushima Daiichi site, contaminated water - in part used to cool melted nuclear fuel - is treated by the ALPS system, which removes most of the radioactive contamination, with the exception of tritium. This treated water is currently stored in

about 1000 tanks on site. The total tank storage capacity amounts to about 1.37 million cubic metres and all the tanks are expected to reach full capacity in late 2023 or early 2024.

Japan announced in April 2021 it planned to discharge treated water stored at the Fukushima Daiichi plant into the sea

over a period of about 30 years, and asked the IAEA to review its plans against IAEA safety standards. In its latest report, the task force noted a number of key outcomes from the latest mission, including that the NRA agreed to require Tepco to review optimisation of protection for the discharge of ALPS treated water based on operational experience and associated monitoring following the start of the discharges. The NRA further agreed to establish a framework for revisiting discharge limits, operating limits, and conditions to reflect the optimisation of protection, “in a similar manner, if needed”.

The task force also acknowledged that the NRA has conducted a review to determine that sufficient evidence exists that the source term contains all the radiologically significant radionuclides and that it does not exclude, in the assessment, any radionuclides that could be significant contributors to the dose to the public

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or to flora and fauna. It found that the NRA's approach to enforce controls on the occupational exposure of Tepco employees is sufficient for compliance with international safety standards.

The task force also acknowledged that the NRA has focused on involving the public in the regulatory review process. The task force will continue to review how public consultations and the involvement of interested parties are handled by the NRA as the regulatory process continues. ... The task force's safety review continues. The IAEA said one more report will be issued on independent sampling and analysis aspects, before the final comprehensive report detailing the collected findings and conclusions of the task force is issued. Japan intends to start discharging the ALPS-treated water in 2023, pending Tepco's completion of necessary domestic regulatory actions.

Source: <https://www.world-nuclear-news.org/Articles/IAEA-assesses-regulatory-preparedness-for-Fukushima>. May 06, 2023.

LIBYA

Libya Lost, Then Found, 2.5 Tonnes of Uranium – a Red Flag for Nuclear Safety

Earlier this year the IAEA Director General Grossi reported that about 2.5 tonnes of uranium ore concentrate had gone missing from a site in Libya. This was arguably one of the largest quantity of uranium ore concentrate that had ever been misplaced. Barely a day after the IAEA's announcement, General Khaled Mahjoub of the self-styled Libyan National Army said the uranium ore had been found about 5km from the

warehouse where it had been stored. A week later, the IAEA, which had been monitoring the stockpile occasionally, confirmed that most of the uranium ore concentrate had been found.

The task force's safety review continues. The IAEA said one more report will be issued on independent sampling and analysis aspects, before the final comprehensive report detailing the collected findings and conclusions of the task force is issued. Japan intends to start discharging the ALPS-treated water in 2023, pending Tepco's completion of necessary domestic regulatory actions.

Firstly, it illustrates the dangers of a IAEA that doesn't have enough resources to monitor uranium ore stockpiles, especially in countries with unstable regimes. And faced with more pressing issues such as the safety and security of nuclear power plants in Ukraine, the IAEA won't prioritise yellowcake storage. Secondly, many African countries still struggle to implement nuclear safety and security governance provisions.

Uranium ore concentrate, popularly known as 'yellowcake', is a type of uranium concentrate powder obtained after uranium ore has been milled and chemically processed. Yellowcake has very low radioactivity, equivalent to the radioactivity of uranium ore found in nature, and it is produced by all countries

where uranium ore is mined. Yellow cake is further processed to become enriched uranium, which is used to manufacture the fuel for nuclear reactors. However, enriched uranium can also be used to

manufacture nuclear weapons. If the technology were available, the 2.5 tons of missing yellowcake would have been half the amount required for a nuclear bomb. Nuclear material experts had said the Libyan uranium ore concentrate in case posed "no significant security risk" as it required prohibitively sophisticated processing capabilities

before it can be suitable for civil or weapons use. Nevertheless, the news of missing Libyan uranium ore concentrate did highlight serious problems with the national and global governance structures for managing uranium. Based on my experience in nuclear non-proliferation and politics, I believe that the missing Libyan uranium debacle illustrates two things. Firstly, it illustrates the dangers of a IAEA that doesn't have enough resources to monitor uranium ore stockpiles, especially in countries with unstable regimes. And faced with more pressing issues such as the safety and security of nuclear power plants in Ukraine,

the IAEA won't prioritise yellowcake storage. Secondly, many African countries still struggle to implement nuclear safety and security governance provisions.

A Regional Destabiliser:

Libya has been unstable since the fall of Muammar Gaddafi's regime in 2011. This plunged the country into a civil war that has destabilised the North African and the Sahel regions, as Libya lost control of the largest and most diverse military arsenals in the region. Much of this arsenal eventually fell into the hands of various non-state actors. Among them were Boko-Haram which mounted a reign of terror in northern Nigeria, and Ansar Al-Sharia in Tunisia.

Gaddafi had amassed stockpiles of nuclear material and technology as he sought to develop nuclear weapons. He had help from AQ Khan, who had been identified as a key facilitator for the global smuggling of nuclear material and technology. Gaddafi eventually abandoned the weapons program in 2003, after months of secret disarmament negotiations with the US and British. Following this deal, the US airlifted about 25 metric tonnes of Libya's nuclear weapon programme components and documents. The last of Libya's enriched uranium was removed in 2009. But there remained in Sabha, the southern Libyan city, about 6400 barrels of uranium ore concentrate. It's this material that was under the control of an army battalion. Olli Heinonen, a former Deputy Director of the IAEA, has since explained that it would have been very costly to airlift the remaining concentrate. He also said there were incentives for Libyans to holding onto the concentrate until the spot price of uranium was high enough for profitable export.

More Questions than Answers: Though the missing 2.5 tonnes of uranium have been

recovered, questions remain: Why did 2.5 tonnes go missing in the first place? Who would have wanted to acquire it? Mahjoub's speculation was

that a group from Chad raided the warehouse in search of conventional weapons. But Heinonen's explanation was that a black market seller could have stolen the concentrate to show it to a prospective buyer. Both explanations raise more concerns about how secure Libya's cache and nuclear materials are. This, despite various mechanisms that have been put in place since the early 2000s in response to

a CIA warning that Al-Qaeda could possibly develop a crude nuclear device. The agency also said the organisation had access to nuclear expertise and facilities.

The UN proposed a number of measures aimed at curbing the proliferation of weapons of mass destruction by non-state actors. These included the UN Security Council Resolution 1540 and the ICSANT. There was also the IAEA Additional Protocol which allowed for more intrusive inspections of nuclear sites. There's also the African Nuclear-Weapon-Free-Zone Treaty - the Pelindaba Treaty - which came into force in July 2009. The Pelindaba treaty establishes the African Commission on Nuclear Energy to ensure compliance with the stipulations of the treaty. Article 10, for example, provides for extensive oversight of nuclear materials on the continent. Libya is a signatory to all these conventions. But reality is that, in the absence of a stable and competent government in Libya, international and regional authorities must fill the nuclear governance vacuum.

African Problems, African Solutions? The IAEA has decried its limited resources. This was long before Moscow's invasion of Ukraine which demanded the agency's attention. African countries should invest in regional

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nonproliferation mechanisms, such as the African Commission on Nuclear Energy, whose responsibilities include the promotion of safe and secure peaceful uses of nuclear energy, as a complementary confidence building measure.

Source: <https://theconversation.com/libya-lost-then-found-2-5-tonnes-of-uranium-a-red-flag-for-nuclear-safety-203775>.
May 01, 2023.

UKRAINE

Nuclear Watchdog's Worries Grow over Ukraine Plant Safety

The head of the UN' nuclear watchdog expressed growing anxiety about the safety of a Russian-occupied nuclear power plant near the front lines of fighting in Ukraine after the Moscow-installed governor of the area ordered the evacuation of the city where most plant staff live. IAEA Director General Grossi spent months unsuccessfully trying to persuade Russian and Ukrainian officials to establish a security zone around the Zaporizhzhia Nuclear Power Plant to prevent the war from causing a possible radiation leak.

Europe's largest nuclear plant is located next to the occupied city of Enerhodar. Ukraine has regularly fired at the Russian side of the lines, while Russia has repeatedly shelled Ukrainian-held communities across the Dnieper River. The fighting has intensified as Ukraine prepares to launch a long-promised counteroffensive to reclaim ground taken by Russia. Ukrainian authorities on Sunday said that a 72-year-old woman was killed and three others were wounded when Russian forces fired more than 30 shells at the city of Nikopol, which

is almost directly opposite the plant. "The general situation in the area near the Zaporizhzhya Nuclear Power Plant is becoming increasingly unpredictable and potentially dangerous," Grossi warned Saturday.

Grossi said the evacuations of civilians from Enerhodar and 17 other communities that Yevgeny Balitsky, the Russia-installed governor of Ukraine's partially occupied Zaporizhzhia province, ordered suggested a further escalation. I'm extremely concerned about the very real nuclear safety and security risks facing the plant, he said. Although none of the plant's six reactors are operating because of the war, the station needs a reliable power supply for cooling systems essential to

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preventing a potentially catastrophic radiation disaster. Analysts have for months pointed to the southern Zaporizhzhia region as one of the possible targets of Ukraine's expected spring counteroffensive, speculating that Kyiv's forces might try to choke off Russia's "land corridor" to the Crimean Peninsula and split Russian forces in two by pressing on to the Azov Sea coast.

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Balitsky said Ukraine's forces had intensified attacks on the area in the past several days. Some of the fiercest ongoing fighting is in the eastern city of Bakhmut, where Ukrainian forces are still clinging to a position on the western outskirts despite Russia trying to take the city for more than nine months. Russian Defense Ministry spokesman Igor Konashenkov said that Moscow's forces had captured two more districts in the city's west and northwest, but

provided no further details.

Source: <https://www.millenniumpost.in/world/nuclear-watchdogs-worries-grow-over-ukraine-plant-safety-517739>, May 07, 2023.

Zaporizhzhia Nuclear Plant Facing ‘Catastrophic’ Staff Shortage Amid Russian Evacuation

Russia plans to relocate about 2,700 Ukrainian staff from Europe’s largest nuclear plant, Ukraine’s atomic energy company has claimed, warning of a potential “catastrophic lack of qualified personnel” at the Zaporizhzhia facility in Russian-occupied southern Ukraine. Workers who signed employment contracts with Russia’s nuclear agency Rosatom following Moscow’s capture of the Zaporizhzhia plant early in the war are set to be taken to Russia along with their families, Energoatom said in a Telegram post.

The company did not specify whether the employees would be forcibly moved out of the plant, nor was it immediately possible to verify Energoatom’s claims about Moscow’s plan. Removing staff would “exacerbate the already extremely urgent issue” of staff shortages, Energoatom said. The Moscow-installed governor of the region ordered civilian evacuations from the area last Saturday, including from the nearby city of Enerhodar where most plant workers live. The full scope of the evacuation order was not clear.

... Soon after Russian troops overran the plant, the IAEA warned that low staffing levels “seriously compromised” one of the fundamental factors in nuclear safety and security, which is that

“operating staff must be able to fulfil their safety and security duties and have the capacity to make decisions free of undue pressure.” The IAEA has

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deployed a handful of staff at Zaporizhzhia in an effort to ensure its safety. Kremlin-installed authorities in the Zaporizhzhia region are accelerating their push to relocate local residents, including families of workers at the plant, due to an expected Ukrainian counteroffensive, Kyiv officials said. Military analysts say Ukraine may focus its expected counteroffensive on the

Zaporizhzhia region, trying to split Russian forces in two by pushing through to the Azov Sea coast in the south.

Relatives of Zaporizhzhia plant staff who agreed to relocate were taken to Russia’s southern Rostov

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region and placed in temporary camps, the Ukrainian General Staff said. It added that plant employees are currently prohibited from leaving Enerhodar. It made no mention of the alleged Russian plan referred to by Energoatom.

Source: <https://www.theguardian.com/world/2023/may/11/zaporizhzhia-nuclear-plant-facing-catastrophic-staff-shortage-amid-russian-evacuation>, May 11, 2023.

SMALL MODULAR REACTORS

PHILIPPINES

NuScale in Talks with the Philippines on SMR Deployment

US SMR developer NuScale Power is interested in investing in the Philippines, the country’s President

Ferdinand “Bongbong” Marcos said during a five-day visit to the USA. He said NuScale plans to conduct a siting study in the Philippines. A meeting with NuScale was held in Washington, DC, on 1 May attended on the Philippine side by President Marcos, Trade Secretary Alfredo Pascual, Energy Secretary Raphael Lotilla, Special Assistant to the President Secretary Lagdameo, Communications Secretary Cheloy Garafil and Philippine Ambassador to the USA Jose Manuel Romualdez. Among the NuScale officials present were Clayton Scott, executive vice president for business, and Cheryl Collins, director for sales.

NuScale was accompanied by Filipino partner Enrique Razon, representing Prime Infrastructure Capital Inc (Prime Infra).

The meeting followed initial discussions held in September last year in New York on the sidelines of Marcos’s participation at the UNGA. Prime Infra has estimated that the future investment value of the project would be in the range of USD6.5-7.5 billion to provide 462 MW to the country by the early 2030’s. ...The NuScale Power Module is a PWR with all the components for steam generation and heat exchange incorporated into a single unit, generating 77 MWe, which in September 2020 became the first SMR design to receive approval from the US Nuclear Regulatory Commission. NuScale offers the units as VOYGR plants: a VOYGR-12 power plant comprising 12 modules is capable of generating 924 MWe. The company also offers four-module and six-module plants and other configurations based on customer needs.

NuScale is currently working with partners in the USA, Romania, Indonesia and Poland on projects to deploy its SMRs. In response to the 1973 oil crisis, the Philippines decided to build the two-unit Bataan plant. Construction of Bataan 1 - a 621 MWe Westinghouse PWR - began in 1976 and it was completed in 1984 at a cost of USD460 million.

Rosatom has gained a licence to build Russia’s first land-based SMR. It aims to build a water-cooled nuclear reactor RITM-200N in the Ust-Yansky district of the Republic of Sakha (Yakutia) in the Russian Far East. Rosatom has so far completed engineering surveys, and has started construction of offsite infrastructure facilities and an early-stage camp for workers. The technology behind SMRs was first developed for naval use and Russia has tested the RITM-200 series of reactors onboard Russian icebreakers.

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nuclear energy in the Philippines’ energy mix, taking into account economic, political, social and environmental objectives. President Marcos included new nuclear among his campaign pledges before winning the election in May last year.

Source: <https://www.world-nuclear-news.org/Articles/NuScale-in-talks-with-the-Philippines-on-SMR-deplo>. May 02, 2023.

RUSSIA

Rosatom to Build Russia’s First Land-Based SMR

Russian nuclear development agency Rosatom has gained a licence to build Russia’s first land-based SMR. It aims to build a water-cooled nuclear reactor RITM-200N in the Ust-Yansky district of the Republic of Sakha (Yakutia) in the Russian Far East. Rosatom has so far completed engineering surveys, and has started construction of offsite infrastructure facilities and an early-stage camp for workers. The technology behind SMRs was first developed for naval use and Russia has tested the RITM-200 series of reactors onboard Russian icebreakers.

Director general of Rosatom, Alexey Likhachev, said, "Pre-construction work is already underway in the area of the village of Ust-Kuyga. More than 2,000 tons of cargo have already been delivered to the site, there are now about 80 workers and 38 pieces of operating equipment there. The scope of work is increasing day by day. The world's first land-based SMR with RITM-200N is planned to be commissioned in 2028." Rosatom said it would conduct an "active dialogue" with foreign customers for its SMR technology as demand for the plants grows.

Source: <https://www.construction-europe.com/news/rosatom-to-build-russia-s-first-land-based-small-modular-nuclear-reactor-smr-/8028548.article>. April 26, 2023.

USA

Westinghouse Electric Announces New SMR Borrowing from its AP1000 Nuclear Technology

Westinghouse Electric announced its latest nuclear technology, designing and building a small modular reactor that borrows from its nuclear portfolio to speed development and reduce costs. At a target cost of about \$1 billion a unit, or \$3,400 per kW, the AP300 SMR design is a 300-MWe single-loop pressurized water SMR. Scaled from Westinghouse's advanced AP1000 reactor, the ultra-compact, modular-built unit uses identical AP1000 nuclear plant technology to include major equipment, structural components, passive safety, fuel and instrumentation and control systems.

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"It's leveraging a proven technology, a very efficient and reliable technology that's already in operation around the world," Patrick Fragman, President and CEO of Westinghouse, said at a news conference. Twelve AP1000 units are in operation or construction, allowing the AP300 to tap into an established supply chain, he said. Demand for nuclear power and SMRs has helped establish a market that didn't exist a few years ago, he said. "We thought there was a big space to propose the AP300 SMR," he said. Site-specific licensing and construction of the first unit is expected

toward the end of the decade and the AP300 SMR will begin delivering power to the grid in a decade, Fragman said.

The SMR will likely be used by industrial customers in addition to utilities, said David Durham, president of energy systems at Westinghouse. The Westinghouse passive safety system, to be used with the AP300, automatically achieves safe shutdown without operator action

Like the AP1000, the AP300 is designed to operate for a life cycle of 80 years or longer. The AP300 SMR design uses Westinghouse's Gen III+ technology that has regulatory approval in the U.S., Great Britain and China and complies with European Utility Requirements standards for nuclear power plants.

and eliminates the need for backup power and cooling supply, the company said. Like the AP1000, the AP300 is designed to operate for a life cycle of 80 years or longer. The AP300 SMR design uses Westinghouse's Gen III+ technology that has

regulatory approval in the U.S., Great Britain and China and complies with European Utility Requirements standards for nuclear power plants. It brings licensing advantages and reduces delivery risk for customers in the utility, oil and gas industries, Westinghouse said. The SMR can be user for district heating and water desalination and integrated with renewable resources. The

reactor also will enable production of hydrogen integrated with the plant, Westinghouse said. The US Nuclear Regulatory Commission in January certified NuScale Power's small modular reactor design, the first of its type to win federal approval.

Source: <https://www.utilitydive.com/news/westinghouse-smr-small-modular-reactor-nuclear-technology-ap1000-ap300/649418/>. May 04, 2023.

Ukraine's nuclear utility Energoatom and Holtec International have signed a Cooperation Agreement aimed at deploying the first SMR-160 Pilot Project in Ukraine with the aim of achieving minimum controlled reactor power and connection to the grid by March 2029. Holtec's SMR-160 advanced SMR is a pressurised light-water reactor, generating 160MWe (525MWt) using low-enriched uranium fuel, with flexibility to produce process heat for industrial applications and hydrogen production.

Ukraine Operations for Holtec International Riaz Awan, and representatives from various Ukrainian organisations, and local news media. A joint project office is being established to undertake the work required for licensing and deployment of Holtec's SMR-160s throughout Ukraine, with a focus on former coal generation sites. ...

Source: <https://www.neimagazine.com/news/newsukraine-agrees-to-deploy-holtec-smrs-10790438>. April 26, 2023.

UKRAINE

Ukraine Agrees to Deploy Holtec SMRs

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The Agreement was signed by Energoatom President Kotin in Kyiv and Holtec International President & CEO Dr Kris Singh in Camden, New Jersey in the presence of Ukrainian Energy Minister German Galushchenko, Vice President of

NUCLEAR COOPERATION

ARMENIA–RUSSIA

Armenia and Russia Discuss Armenian 2 Operating Extension, and New Nuclear

During the meeting, in Yerevan, the two "agreed on specific steps for the near future, which will allow the re-extension work to be launched by the end of this year". According to Rosatom "during the meeting the construction of new nuclear power units in Armenia was also touched upon" and they were "ready to offer Russian-designed nuclear power plants with VVER reactors". The PM's office reported that the talks also saw the sides discuss "possible cooperation in the field of nuclear medicine," as well as partnership on decontamination of

Rosatom signed an agreement with the management of the Armenian nuclear power plant in January last year to look into the possible building of new Russia-designed units on the site of the current plant at Metsamor. Armenia has long been in discussions with Russia about replacing Metsamor, which comprises two Russian-built 376 MWe VVER reactors which started operating in 1976 and 1980, respectively.

hazardous waste at the former Nairit chemicals plant. Rosatom said that it had "unique technologies for bringing complex industrial facilities to a safe state" and was ready to tackle the issues at Nairit.

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In November 2021 it was announced that the service life of unit 2 had been extended to 2026 after collaboration with Rosatom which saw the unit's emergency cooling system, engine room, turbines, steam generators modernised, and a unique operation carried out to anneal the reactor pressure vessel. As a result of the modernisation, the station's capacity increased by almost 10% and there are plans for a further 10-year extension to 2036.

Source: <https://www.world-nuclear-news.org/Articles/Armenia-discusses-second-nuclear-power-plant>. May 04, 2023.

SOUTH KOREA–HUNGARY

S.Korea Seeks Cooperation with Hungary on Nuclear Power Generation

South Korea's Industry Minister Lee Chang-yang proposed enhanced cooperation with Hungary on nuclear power and various other advanced industry sectors, the Industry Ministry said. He

made the call during a meeting with Hungarian Parliamentary Speaker Laszlo Kover in Seoul, where the two sides discussed ways to enhance bilateral economic ties, and promote trade and investment, according to the Ministry of Trade, Industry and Energy. Lee sought chances of joint work with Hungary on SMRs, as South Korea is developing an innovative SMR and Hungary is considering the introduction of SMRs to expand its nuclear energy development, Yonhap news agency reported. The Minister also asked for Hungary's support for South Korean firms operating there, as concerns have grown over adverse impacts of the European Union's recent regulations on foreign subsidies and the battery industry, among other things, on their businesses. ...

Lee sought chances of joint work with Hungary on SMRs, as South Korea is developing an innovative SMR and Hungary is considering the introduction of SMRs to expand its nuclear energy development, Yonhap news agency reported. The Minister also asked for Hungary's support for South Korean firms operating there, as concerns have grown over adverse impacts of the European Union's recent regulations on foreign subsidies and the battery industry, among other things, on their businesses.

Source: <https://theshillongtimes.com/2023/05/09/s-korea-seeks-cooperation-with-hungary-on-nuclear-power-generation/>. May 09, 2023.

UAE–CHINA

UAE Signs Nuclear Energy Cooperation Agreements with China Bodies

Emirates Nuclear Energy Corporation (ENEC), the body responsible for developing the United Arab Emirates' nuclear energy sector, has signed three agreements with Chinese nuclear energy organisations as it looks to boost low-carbon nuclear power. The UAE, which is hosting the COP28 climate summit this year and wants to get 6 per cent of its energy needs from nuclear as part of its 2050 net zero plan, has previously said China would be a key partner in its energy transition plan. The three MoU cover cooperation

in nuclear energy operations, in high temperature gas-cooled reactors, and in nuclear fuel supply and investment, ENEC said. They were signed with China's Nuclear Power Operations Research Institute, the China National Nuclear Corporation Overseas, and the China Nuclear Energy Industry Corporation. The UAE is already building the Arab world's first multi-unit operating nuclear energy plant, the Barakah plant in Abu Dhabi. When completed Barakah will have four reactors with 5,600 MW of total capacity - equivalent to around 25 per cent of the UAE's peak demand.

Source: <https://www.khaleejtimes.com/business/energy/uae-signs-nuclear-energy-cooperation-agreements-with-china-bodies>. May 07, 2023.

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weapons. "The TPNW is the best tool for creating pressure and momentum towards this end. It has benefits regionally as well as globally," she said.

Eighteen Arab League states – Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Tunisia, the UAE, and Yemen – voted to adopt the TPNW in 2017.

Furthermore, all Arab League states that are UN

members supported the UN General Assembly resolution in 2016 to establish the mandate for negotiating this treaty. When the TPNW entered into force in 2021, the secretary-general of the Arab League, Ahmed Aboul Gheit, said that he hoped it would "usher in a new phase and provide an incentive to intensify international efforts to achieve the ultimate goal of getting rid of nuclear weapons once and for all". He added that "the time has come to intensify international efforts

to establish a nuclear-weapon-free zone in the Middle East, which is fully compatible with the objectives of the [TPNW]".

Israel – the only state in the Middle East to possess an arsenal of nuclear weapons – did not participate in the negotiating process for the TPNW in 2017 and has not yet joined the treaty. It has emphasised that it is not obliged by it in any way. To

date, a total of 92 states have signed the TPNW and 68 have ratified or acceded to it, including the Arab League members Algeria (signatory), Comoros (party), Djibouti (signatory), Libya (signatory), Palestine (party), and Sudan (signatory). Most other members have voiced their support for the TPNW

NUCLEAR DISARMAMENT

GENERAL

Arab League States Discuss Development in Disarmament, including the TPNW

Organised jointly by the Arab League and Qatar's National Committee for the Prohibition of Weapons, the Second Arab Forum on Arms Control, Disarmament, and Non-Proliferation took place in the Qatari capital, Doha, from 2 to 4 May. ICAN was invited to attend as a representative of civil society and make a presentation on the TPNW. Amel El Mejri, ICAN's Arab League liaison, described the forum as an excellent opportunity for officials and experts from Arab states to discuss the vital need for rapid progress towards the elimination of nuclear

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in various international forums. Last June, nine members participated in the first meeting of states parties to the TPNW, either as parties or observers.

In the first committee of the UN General Assembly in October, the group of Arab states described the TPNW as “an important treaty” that closes a major legal gap and represents “a new customary source of international law governing the field of disarmament”. They added that the TPNW “does not contradict” the 1968 Non-Proliferation Treaty, but rather “complements it and pushes the achievement of its objectives”. At the forum in Qatar this week, ICAN underscored the need to build universal support for the TPNW. ... Arab League states are meeting in Qatar this week to discuss challenges in the field of disarmament. The Treaty on the Prohibition of Nuclear Weapons is a feature of the discussions.

Source: https://www.icanw.org/arab_forum_2023. May 02, 2023.

JAPAN

Japan Mulls Issuing G7 Outcome Document on Nuclear Disarmament

The Japanese government is considering issuing an outcome document on nuclear disarmament and non-proliferation at the Group of Seven summit in May. The summit is set to begin on May 19 in Hiroshima, western Japan. Near the end of World War Two, it became the first city in the world to suffer the horrors of an atomic bombing. Main items on the agenda are expected to include the war in Ukraine, nuclear disarmament and non-proliferation, and the situation in the Indo-Pacific region as well as China’s moves in the region. Foreign ministers from the G7 nations held talks

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last week ahead of the summit and agreed to work to achieve a nuclear-free world.

Japanese Foreign Minister Hayashi Yoshimasa stressed that the ministers discussed in detail nuclear disarmament and non-proliferation as the upcoming summit will be held in Hiroshima.

Japanese Senior Deputy Minister for Foreign Affairs Ono Keiichi serves as a “Sherpa” — the personal assistant of PM Kishida for the G7 summit. Ono has been holding talks behind the scenes with officials from the other G7 nations about issuing an outcome document at the summit, in addition to a joint statement by the G7 leaders. Japan, as the G7 chair, wants to issue a strong message from Hiroshima to push for the abolition of nuclear weapons.

Source: https://www3.nhk.or.jp/nhkworld/en/news/20230426_03/. April 25, 2023.

NUCLEAR WASTE MANAGEMENT

SWEDEN

IAEA Mission Commends Sweden’s Management of Nuclear Power Plant Radioactive Waste and Spent Fuel, Encourages Improvements for Governance of Some Other Radioactive Waste

Sweden has a comprehensive, robust and well-functioning system for safely managing radioactive waste and spent nuclear fuel from nuclear power plants and commended the country’s development of a concept for spent fuel disposal. The mission advised Sweden to improve its national policies and strategies for non-nuclear radioactive waste that originates, for example, from industrial uses, research, or medical applications.

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non-nuclear radioactive waste that originates, for example, from industrial uses, research, or medical

applications. The Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) team concluded the eleven-day mission to Sweden on 27 April. The team comprised eight experts from Belgium, Finland, France, Germany, the Netherlands, Norway, Switzerland, the US and three IAEA staff members. The mission was carried out at the request of the Government of Sweden to support the country in meeting the European Union (EU) obligations under the Council Directive on radioactive waste and spent fuel management. The mission was hosted by the Swedish Radiation Safety Authority (SSM). An observer from the European Commission attended the mission.

Sweden generates more than 30 per cent of its electricity from six nuclear reactors. Radioactive waste primarily originates from the operation of these nuclear reactors. Radioactive waste also originates from medical and research institutions and industry and consumer products such as smoke detectors. There is also an amount of radioactive waste from past activities which is stored pending disposal. The ARTEMIS team found that Sweden demonstrates a solid commitment to ensuring the safe implementation of nuclear radioactive waste and spent fuel management activities in the country, including its efforts towards establishing a deep geological facility. The team recognized the way in which Sweden has developed and implemented the KBS-3 concept for spent fuel disposal as a good practice. The review team leader, François Besnus, Director of Radioactive Waste Safety Division of the French Institute for Radiation Protection and Nuclear Safety (IRSN), said, "the government has established conditions for the KBS-3 technique to be developed into a mature concept, earning widespread support among stakeholders".

The team also identified recommendations and

suggestions to maintain and further improve the safe and responsible management of radioactive waste in Sweden, including: Ensuring that safe management routes are made available for all types of radioactive waste and that sufficient resources are appropriately allocated for this purpose; Using the national plan as a strategic planning component to monitor the implementation of the national policies; Establishing a stakeholder forum to coordinate preparations for the future disposal facility for long-lived radioactive waste....

The government says this means that capping will start on the Low-Level Waste Repository in 2024-25, thermal treatment technologies will be developed as a proven technology by 2026-27 and decisions on the communities to progress as part of the Geological Disposal Facility programme will be made by 2026.

Source: [https://www.iaea.org/newscenter/pressreleases/iaea-mission-commends-swedens-](https://www.iaea.org/newscenter/pressreleases/iaea-mission-commends-swedens)

management-of-nuclear-power-plant-radioactive-waste-and-spent-fuel-encourages-improvements-for-governance-of-some-other-radioactive-waste. May 02, 2023.

UK

NWS Launches Strategy for Nuclear Waste Management and Disposal

The government says the NWS strategy, published today (25 April), is focused on key strategic objectives to ensure that the "right waste form, in the right package, is managed or disposed of at the right facility". According to the government, the NWS will support "accelerated decommissioning" through innovation, with legacy and future waste streams managed in the most "sustainable and efficient" way through technology development, expertise and setting worldwide standards to provide value for the UK. The government says this means that capping will start on the Low-Level Waste Repository in 2024-25, thermal treatment technologies will be developed as a proven technology by 2026-27 and decisions on the communities to progress as part of the Geological Disposal Facility programme will be made by 2026. NWS brings together the UK's nuclear waste management capabilities, the government says and is part of the NDA (Nuclear

Decommissioning Authority) group, which has a collective long-term goal to clean up nuclear sites safely, securely and cost-effectively.

In a joint statement, NWS Chair Adrienne Kelbie and NWS CEO Corhyn Parr, said: "Our purpose is clear: to make nuclear waste permanently safe, sooner. And we want to become the 'one-stop shop' for nuclear waste management and disposal solutions in the UK. "This strategy sets our direction, objectives, key milestones and the transformation needed to succeed by 2030. Our strategic objectives are focused on ensuring all

our operations are safe and secure and the right waste is in the right place, accelerating decommissioning and adding value for the UK. "We'll prioritise working with and doing the right thing for our people, partners, customers, and communities where we operate. Our strategy objectives are built to be enduring and responsive to influences from the global and nuclear landscape as it evolves and changes."

Source: <https://www.circularonline.co.uk/news/nws-launches-strategy-for-nuclear-waste-management-and-disposal/>. April 25, 2023.



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