



**OPINION – Bharat H. Desai**

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**Nuke Threat Calls for Review of Security Measures**

The marathon 10th review conference of the NPT concluded without an outcome on August 26 in New York. “The Nuclear NPT is an essential pillar of international peace and security, and the heart of the nuclear disarmament and non-proliferation regime,” UN Secretary-General (UNSG) Guterres said. The stalemate has been attributed to refusal by the nuclear-weapon states, namely the US, the Russian Federation, the UK, China and France, to agree to any tangible progress on the implementation of agreed nuclear disarmament commitments.

On August 1, the UNSG’s address to the NPT review conference expressed grave concern that “humanity is just one misunderstanding, one miscalculation away from nuclear annihilation”. “Almost 13,000 nuclear weapons are now being held in arsenals around the world. All this at a time when the risks of proliferation are growing and guardrails to prevent escalation are weakening,” Guterres said. In his address, Japanese PM Kishida swore to work towards “the ideal of nuclear disarmament”. On August 4, on behalf of

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US President Biden, Ambassador Scheinman assured that “the United States will continue the long work toward eventual nuclear disarmament”.

August also brought back vivid memories of the lethal capacity of the bombs that were dropped on the Japanese cities of Hiroshima (August 6) and Nagasaki (August 9) in 1945. It showed the destructive human streak for nuclear annihilation. Last month, Guterres

became the second UN chief to go to the bomb site to share the collective grief of the Japanese

people. The UNSG alerted the world about the danger of forgetting the lessons of Hiroshima and Nagasaki. "Nuclear weapons are nonsense. They guarantee no safety — only death and destruction.

Three quarters of a century later, we must ask what we've learned from the mushroom cloud that swelled above this city in 1945," the UNSG said.

The world had been stunned by the dropping of atomic bombs by US bombers on Hiroshima (Little Boy) and Nagasaki (Fat Boy). They instantly killed 1-2 lakh people and destroyed the infrastructure of both cities. Left with no choice, Japan surrendered on August 15. It formally brought an end to the World War II. It seems, rattled by the prospects of impending Russian advances that would have forced the Japanese to surrender to them, US President Truman ordered the use of bombs that changed the world order forever. "Japan was already defeated...dropping the bomb was completely unnecessary," President Dwight Eisenhower said years later.

On May 27, 2016, Barack Obama became the first sitting US President to appear at the Hiroshima bomb site. Obama laid a wreath at Hiroshima's Peace Memorial Park and paid homage to the departed souls. "We stand here in the middle of this city and force ourselves to imagine the moment the bomb fell...we listen to a silent cry...demonstrated that mankind possessed the means to destroy itself," Obama said. Though short of a formal US apology, the sheer presence of the US President at the site of Hiroshima bombing reflected the quest for atonement and time as the final arbiter for all. Over the past 77 years, global efforts have sought to realise the dream of nuclear

**Though short of a formal US apology, the sheer presence of the US President at the site of Hiroshima bombing reflected the quest for atonement and time as the final arbiter for all. Over the past 77 years, global efforts have sought to realise the dream of nuclear non-proliferation, nuclear weapons free world and universal disarmament.**

**Ahead of the NPT review, the ICAN carried out a legal analysis. It showed that the nuclear arsenals of China and Russia have grown; the UK has raised the cap on the maximum number of warheads and the five nuclear states spent billions of dollars on nuclear weapons. Have they pursued negotiations in good faith (NPT article VI obligation) to end the nuclear arms race.**

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In this respect, the 1968 NPT has been a significant pillar. Its 191 state parties assembled in New York during August 1-26, for the NPT Tenth Review. It took place in the aftermath of an unprecedented January 3, 2022, joint statement of the leaders of the five nuclear-weapon states for Preventing Nuclear War and Avoiding Arms Races.

"We affirm that a nuclear war cannot be won and must never be fought. As nuclear use would have far-reaching consequences, we also affirm that nuclear weapons — for as long as they continue to exist — should serve defensive purposes, deter aggression, and prevent war," the joint statement proclaimed. They also reiterated their commitment (NPT article VI) "to pursue negotiations in good faith on effective measures relating to cessation

of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament."

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billions of dollars on nuclear weapons. Have they pursued negotiations in good faith (NPT article VI obligation) to end the nuclear arms race? The aftermath of the February 24 Russian 'special military operation' in Ukraine and the threat of potential use of nuclear weapons pose a grave risk to the efficacy of the NPT. Sweden and Norway have also indicated the adoption of a new security posture.

The CTBT, adopted via the General Assembly resolution 50/245 on September 10, 1996, requires ratification by “all states listed in Annex 2 to the Treaty”. The basic obligation under CTBT would be “not to carry out any nuclear weapon test explosion or any other nuclear explosion”. As on August 1, 174 nations have ratified CTBT. Still, seven are left — US, China, India, Pakistan, Israel, Iran and North Korea — out of 44 (Annex 2, Article XIV) whose ratification is essential for CTBT to come into force.

Interestingly, all nations proclaim the objective of elimination of nuclear weapons. India’s nuclear doctrine of January 4, 2003, swears by the “commitment to the goal of a nuclear weapon-free world, through global, verifiable and non-discriminatory nuclear disarmament”. Ironically, the technical barriers remain in the operationalisation of international legal instruments for elimination of nuclear weapons. These arise from all pervasive human insecurity and the streak to dominate others. Only time shall bring sanity in the minds of those who swear by the nuclear sword by delegitimising its use either by accident or design for the safety of life on our only one earth....

Source: <https://www.tribuneindia.com/news/comment/nuke-threat-calls-for-review-of-security-measures-428590>, 05 September 2022.

**OPINION – Khang Vu**

**Why Vietnam Should Not Go Nuclear**

Since the end of the Cold War, Vietnam has sat in a precarious position, with threats from China increasing on both land and sea. On a like-for-like basis, Vietnam stands little chance of matching Chinese military power. As such, it is natural that some scholars have suggested that Vietnam pursue nuclear weapons in order to balance against China. Nuclear weapons are a great equalizer for weak states vis-à-vis strong states,

and would enable Vietnam to deter Chinese aggression once it can no longer engage in a conventional arms race with China.

However, while this argument seems logical, it neglects the history of how Vietnam has perceived the role of nuclear weapons in its security strategy, especially in its relationship with China. Vietnam did have the nuclear option in the late 1970s and 1980s under its alliance with the Soviet Union,

during which the Soviets gave Vietnam nuclear-capable missiles, though not nuclear warheads themselves. But the Soviet Union could have supplied Vietnam with the warheads if it decided to and if Vietnam accepted them. Moscow even built shelters for its nuclear submarines in Cam Ranh Bay, which it relied on to patrol the South China Sea.

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Ultimately, Vietnam opted against hosting Soviet nuclear warheads for one simple reason: it did not want to hurt its relationship with China at a time when both countries were in the process of normalizing diplomatic relations in the late 1980s.

To make a case for not hosting nuclear weapons, Vietnam reviewed the 1978 Treaty of Friendship and Cooperation with the Soviet Union and argued that the treaty did not contain any clauses saying Moscow would be allowed to station nuclear warheads in Cam Ranh Bay. It is also worth reminding that the Soviet Union-Vietnam alliance had lost some cohesion since the mid-1980s due to Soviet economic decline and its own efforts to normalize ties with China. Had Vietnam been keen on nuclear weapons to deter China at all costs, it should have accepted those weapons when its economy was no longer able to maintain a million-man strong conventional army. Vietnam’s decision to not go nuclear was vital to its normalization of diplomatic relations with China in 1991.

After its refusal to host Soviet nuclear weapons

and the substantial Soviet withdrawal from Cam Ranh Bay, Vietnam joined the Treaty on the Southeast Asia Nuclear Weapon-Free Zone in 1995, under which signatories pledged not to “develop, manufacture or otherwise acquire, possess or have control over nuclear weapons; station or transport nuclear weapons by any means; or test or use nuclear weapons.” Its reason for joining the treaty was strategic – it hoped the treaty would constrain

Chinese military options in the region. Vietnam then joined and ratified the Comprehensive Test Ban Treaty in 1996 and 2006, respectively, which affirmed Hanoi’s commitment to nonproliferation. Vietnam has also been a member of the NPT since 1982. It is not an overstatement to claim that Vietnam’s decision to not host Soviet nuclear weapons and to participate in the Southeast Asian nuclear-free zone was essential to its reintegration with the international community, a move that North Korea has so far failed to take.

Under this context, Vietnam going nuclear would fundamentally unravel Hanoi’s post-Cold War foreign policy of diversification and multilateralization. Pursuing nuclear weapons would immediately tarnish Hanoi’s export-led growth strategy due to the international sanctions that would likely result, and would downgrade its international status to that of a pariah like North Korea. It would also hurt Hanoi’s legal challenges against Chinese activities in the South China Sea, since Vietnam would also be breaking its commitment to multiple international treaties at a time it needs those treaties to be on its side the most. And these scenarios are not fanciful.

**For Vietnam, going down the nuclear path would be a matter of self-defense; but for China, it would be a strong signal that Vietnam harbors aggressive intentions. Nuclear weapons are a cause of stability only when both states have a secured second-strike capability, which Vietnam would not have for a long time after it decided to go nuclear.**

**To protect its second-strike capability, China has managed its nuclear arsenal for at least 50 years while Vietnam has zero experience managing one on its own, which would also raise the risks of accidents if Vietnam ever decided to go nuclear. This is to counter the argument that having a nuclear arsenal could equalize the huge power disparity between Vietnam and China and free Vietnam from a conventional arms race with China.**

Vietnam was indeed a pariah just 40 years ago when it was contemplating hosting Soviet nuclear weapons. Moreover, it is unclear if having nuclear weapons would increase Vietnam’s security. Vietnam should never antagonize China because its security and prosperity depend on a good Vietnam-China relationship. For Vietnam, going down the nuclear path would be a matter of self-defense; but for China, it would be a

strong signal that Vietnam harbors aggressive intentions. Nuclear weapons are a cause of stability only when both states have a secured second-strike capability, which Vietnam would not have for a long time after it decided to go nuclear. China would not be shy of carrying out surgical strikes against Vietnam to rid it of its infant nuclear program and prevent Vietnam from having a second-strike capability, as Israel did to Syria in 2007.

Importantly, even if Vietnam successfully gets a second-strike capability at a high cost, it is also uncertain whether it could maintain that capability in the long run considering its weaker economic and technological foundation. China can always carry out a splendid first strike because its missiles are more accurate and numerous, and they are supported by a superior surveillance capability. To protect its second-strike capability, China has managed its nuclear arsenal for at least 50 years while Vietnam has zero experience managing one on its own, which would also raise the risks of accidents if Vietnam ever decided to go nuclear. This is to counter the argument that having a nuclear arsenal could equalize the huge power disparity between

Vietnam and China and free Vietnam from a conventional arms race with China.

Even assuming the unlikely scenario that Vietnam has the capability to maintain its second-strike capability, it is not credible for Vietnam to deter Chinese aggression on the South China Sea with nuclear weapons. This is because those islands lack strategic significance to Vietnam's survival and China's attacks against Vietnam's islands are likely to fall below the threshold that would justify a nuclear attack. And even if China launches a ground invasion of Vietnam, Hanoi would still be able to repel it and credibly signal to China without a need for nuclear weapons, much like it did in 1979. In short, nuclear weapons would be both unnecessary and harmful for Vietnam.

Vietnam wants "to be friends with all countries and never to antagonize anyone." For such a policy to work, a commitment to nuclear nonproliferation is a must. Vietnam said no to nuclear weapons in the 1980s when it was in a worse position than it is right now; as such, it can and should do so again....

Source: <https://thediplomat.com/2022/09/why-vietnam-should-not-go-nuclear/>, 09 September 2022.

**OPINION – Global Times**

**Nuclear Proliferation Caused by AUKUS will Make the World Sweat in the Face of Teetering Security**

Exactly one year ago, on September 15, 2021, Australia, the UK and the US jointly unveiled the creation of their enhanced trilateral security partnership called "AUKUS." Under their deal, London and Washington agreed to help Canberra build and operate Australia's own fleet of nuclear-propelled submarines. One year on, as AUKUS is propagandized to respond to a so-called threat

that does not exist at all, the group has been fueling the real threat of nuclear proliferation, arms race, and even war.

Whenever AUKUS is touched upon, there is an unavoidable issue that cannot be skirted around - the transfer of nuclear materials among the three countries is essentially nuclear proliferation, which is uncontrollable. Australia, the UK and the US are all signatories to the NPT. However, the three countries have ignored the AUKUS-related discussions at the IAEA Board meetings and in relevant intergovernmental processes, while trying to set up a separate agenda on the issue, with the aim of whitewashing their proliferation activities.

But no matter what tricks they have tried hard to play, they cannot change the basic fact - the cooperation among the three countries involves the transfer of nuclear submarine power reactors and weapons-grade highly enriched uranium to non-nuclear-weapon states. It means Australia has the chance to use the uranium to develop and manufacture nuclear weapons. It also means other non-nuclear-weapon states may follow suit.

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The NPT is one of the most crucial cornerstones of global security. Unfortunately, the wheels of AUKUS are scrunching it. "This sets a risky precedent since potential nuclear proliferators may use naval reactor programs as a cover for developing nuclear weapons and, with the AUKUS deal as a precedent, they may escape intolerable costs for doing so," The National Interest magazine commented in its August issue. In other words, the byproduct of AUKUS will make the world sweat in the face of teetering security.

That's why a meeting of the IAEA Board of Governors decided by consensus to set up a formal agenda item on "Transfer of nuclear materials in the context of AUKUS and its

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safeguards in all aspects under the NPT." It mirrors that the issue should not be handled by the three countries themselves alone, but must be handled jointly by the IAEA member states with due procedure. Wang Qun, China's permanent representative to the UN in Vienna, said the move "foiled certain countries' attempt to hijack the IAEA Board meeting," and that it is the victory of the Vienna spirit over hegemonism.

The result fully reflects the concern of the international community on the transfer of nuclear weapons-grade materials involved in the cooperation of the three countries, and shows that the US-style collaboration among small circles is far from having popular support. The unpopular side of AUKUS can also be found among Australia's neighboring countries, especially among ASEAN.

Due to the AUKUS, ASEAN members are caught in a security puzzle where everyone feels at risk, because they will one day have to face a close and growingly aggressive neighbor whose military strength is boosting. The previous balance of power will be broken. They are pondering whether to enhance their own military arsenals as a response to potential danger. An arms race could be triggered at any time.

More importantly, if AUKUS yearns for sufficient follow-up development momentum in the Asia-Pacific region, it needs crises, turmoil and even conflicts. Without these, AUKUS has no "justified" cover to promote itself. But with the chaos, ASEAN will simply be stripped of development opportunities.

The existence of AUKUS itself is something that has jeopardized the security and well-being of all Indo-Pacific countries. Most ASEAN members are

well aware of it. Their resistance and anxiety against AUKUS will only increase. In turn, regional

countries' opposition to AUKUS will have impact on the group's development. AUKUS will still be promoted in years to come, but it may not succeed.

Not only do Australia's neighboring countries have concerns, some Australians also raised their doubts over AUKUS. Australia "has never before placed itself at the forefront of US planning for a

confrontation with a superpower. And it has never before gone so dramatically on the offensive in its weapons acquisition," wrote Sam Roggeveen, director of the International Security Program of Sydney-based Lowy Institute. "This is a question not just of military strategy but of how Australia defines itself as an international actor, and as a nation."

Former Australian diplomat Bruce Haigh tweeted in June, "AUKUS is all about the US using Australia to confront China." But what has Canberra earned for joining the club? Apart from showing its naivety, all it gets is the risk of nuclear proliferation and more

resentment from regional countries. On the surface, it may have obtained US' assurance of security protection, but it also has turned itself into an arm of US Indo-Pacific Command, or even a US' suicide squad - when war breaks out, Australia will bear the brunt first.

With so many negative AUKUS assets on its shoulders, ranging from self-interests to world security, if the current Australian administration is wise, it should start thinking of how to lead Australia out of this trap, dug by its predecessor, instead of plunging deeper.

Source: <https://www.globaltimes.cn/page/202209/1275275.shtml>, 14 September 2022.

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OPINION – Benjamin Plackett

## Why France's Nuclear Industry Faces Uncertainty

Around 70% of French electricity is derived from the splitting of atoms, and no other country produces more nuclear power per capita. More than a means of keeping the lights on, France's prowess in the nuclear space is also a source of national pride — the amalgamation of decades of research that stretch back to the discovery of polonium and radium by Marie Skłodowska Curie and Pierre Curie in Paris in the late 1890s. Today, nuclear energy earns the country more than €3 billion (US\$3 billion) per year in electricity exports. This has taken on fresh saliency as global energy prices spike in response to Russia's invasion of Ukraine.

Yet the nuclear energy industry in France is facing significant challenges. Climate change, for example, is already hampering French nuclear output. An especially hot and dry summer has warmed the country's rivers and lowered water levels, reducing the ability of its energy companies to use the water to cool nuclear reactors. Some power plants are beginning to show their age and require extensive maintenance for corrosion damage, which could end up taking years. All of this has conspired to force half of France's nuclear reactors offline for now. This couldn't have come at a worse time: Europe's energy prices and supplies are already under immense pressure following the invasion of Ukraine. Politics is also

**While India needs to significantly increase the scope of big nuclear power projects, the emergence of SMR can be a cost-effective, compact and powerful bridging option to increase green energy supply in the country. Installing SMRs on industrial sites replacing coal plants will generate employment, reduce construction costs, transmission issues and air pollution.**

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at play. In the wake of presidential and parliamentary elections this year, the future of nuclear energy in France seems less certain.

Critics of centrist President Macron, who was re-elected in April for a second five-year term, accuse him of being inconsistent on nuclear policy. He previously promised to reduce France's reliance on nuclear energy, and 2 years ago he pushed ahead with shutting a 42-year-old plant in Fessenheim, close to the

border with Germany. Macron's tone has since shifted: in February, he announced plans to build 6 new reactors at an estimated cost of €50 billion, with the first coming online by 2035.

To achieve this, however, he will need the backing of parliament, which is likely to be difficult following legislative elections in June. The coalition that includes Macron's Renaissance party won 42.5% of seats — more than any other party, but not enough to keep a governing majority. Voters instead endorsed parties from the far right and left. The coalition of left-wing parties, led by anti-nuclear politician Jean-Luc Mélenchon, gained 22.7% of seats. The far right, led by pro-nuclear politician Marine Le Pen, took 15.4% — but cutting a deal with Le Pen, who is a long-time presidential rival of Macron, could prove politically problematic. Those who work in or study nuclear power in France are wondering what this means for the industry. Nature spoke to four specialists, each with their own perspective on what this political climate could mean for the future of nuclear power.

Today's nuclear power infrastructure was born out

of the French government's efforts in the 1950s and 1960s to develop a nuclear bomb during the cold war, and so a lot of resources were poured into nuclear research. That created the expertise, then in the 1970s the oil-price shock turned attentions towards nuclear-power development. Countries began to rethink their energy strategies as they tried to reduce dependence on foreign oil.

For France, the answer was nuclear power and, in 1974, prime minister Pierre Messmer even expressed a desire that all of France's electricity should come from nuclear power. Although that didn't happen, the 1980s and 1990s saw a rapid expansion of nuclear power capacity in France: 56 reactors were built in just 15 years. This created a critical mass of both knowledge and infrastructure that really allowed nuclear power to establish itself, but not everyone agreed it was a good thing.

A lot of people still don't want nuclear. Activists in the environmental movements say they want only renewable energy, but that's technically a very difficult thing to pull off. I don't think Macron was particularly interested in this topic during his first term, so he just followed the political precedent set by his socialist predecessor, François Hollande, who closed a nuclear power station in the final months of his presidency.

But the question of climate change and how to manage greenhouse-gas emissions has become increasingly pertinent. In a 2022 paper I published with collaborators, we investigated the environmental impacts of four electricity-production scenarios with differing levels of nuclear output. Solar and wind systems take quite a bit of power to install and require more building materials than do the scenarios that lean more heavily on nuclear. Of course, nuclear power in France also has the advantage of a well-established existing network.

We concluded that the scenarios with a large percentage of nuclear power, such as France's current nuclear portfolio, have the lowest environmental impact. If we don't want to produce energy from fossil fuels, which is essentially the problem we're all trying to solve here, then the most stable answer is nuclear energy. We don't necessarily need to be at 70%, but perhaps 50% will be required.

I think Macron has now come around to this point of view, which is clear in his speeches when he talks about energy policy, but Mélenchon's coalition might try to prevent the reactors from being built.

The history of nuclear energy in France is very interesting because it has created constraints. It has made the pro-nuclear side of the argument into the status quo. The industry has worked hard to normalize the use of nuclear energy, and that shapes the whole policy debate — any time you want to reduce the percentage of nuclear energy, you must take on this normalized culture.

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When it comes to discussing the risks around nuclear power, this takes a back seat in comparison to the economic and political arguments. The debate is framed as one of energy independence. People often use Germany as an example of a country that drastically cut its nuclear energy production — in response to safety concerns raised by the Fukushima nuclear disaster in Japan in 2011 — only to end up buying electricity from France.

Although there's a lot of talk now about what Mélenchon's success in the parliamentary elections will mean for French nuclear power, you have to remember that he has to fight against entrenched attitudes. The communist party is also a part of Mélenchon's left-wing alliance and has been a supporter of nuclear energy, so although the left wing looks united now, there are questions about how long that can last. I still think it's an uphill struggle for Mélenchon and those who want to reduce France's reliance on nuclear energy.



My opinions on nuclear technology and nuclear power have changed drastically over the decades. I used to be an anti-nuclear leader. I went to all the demonstrations and protests, but things shifted for me in 1988 with the creation of the Intergovernmental Panel on Climate Change (IPCC). Its reports made it clear that the biggest and most important environmental challenge was climate change and not necessarily the management of nuclear waste. Ever since then, I've been firm in my opinions that nuclear energy has serious benefits. I wouldn't say I'm pro-nuclear as such, but I can't deny that nuclear energy does take care of most environmental concerns in terms of greenhouse-gas pollution. The urgency of climate change makes me see the advantages of nuclear energy.

Germany became the beacon of the environmental movement in getting rid of its nuclear capacity, which is stupid because it produces more greenhouse gas as a result. Renewables were the motto, and it succeeded in making France feel a little ashamed of its nuclear success. This is the context of Macron's previous lukewarm feelings towards nuclear. His opinions have now changed, but the problem with him is that he often changes his mind back and forth. He doesn't always stay the course. I changed my mind once and then stuck to it, but it doesn't feel impossible that he could change his mind yet again. At the moment, he's in favour of nuclear energy.

When I look at the current political make-up of the French parliament, I would agree that the path to stopping or reducing nuclear power is a tough one because there's still a majority in favour of nuclear,

despite a strong opposition. All of that notwithstanding, I would always be anxious about politics — things can change quickly. Our findings seem to suggest that the climate-change argument for nuclear isn't necessarily cutting through. We found that people who were most concerned about climate change were more likely to have negative opinions about nuclear energy, and that held true across all four countries. I

don't think there's anything specific about the French public's opinions. This relationship between climate concern and anti-nuclear sentiment remained even when we controlled for political persuasion, gender, age and education. Nuclear energy is often seen as a necessary evil to combat climate change, but it's rarely enthusiastically embraced. Those looking for a way to argue for nuclear investments might want to think about

alternative framings, such as energy security, becoming independent of Russian gas and achieving a cheaper cost of living...

Source: <https://www.nature.com/articles/d41586-022-02817-2>, 05 September 2022.

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## NUCLEAR STRATEGY

### NORTH KOREA

#### **Kim Jong-un Says New Law Guarantees North Korea will Never Give Up Nuclear Weapons**

North Korea has passed a law enshrining the right to "automatically" use preemptive nuclear strikes to protect itself, a move leader Kim Jong-un said makes its nuclear status "irreversible" and bars any denuclearisation talks, state media has reported. The move comes as observers say North Korea appears to be preparing to resume nuclear

testing for the first time since 2017, after historic summits with the then President Trump and other world leaders in 2018 failed to persuade Kim to abandon his weapons development. The North's rubber-stamp parliament, the Supreme People's Assembly, passed the legislation as a replacement to a 2013 law that first outlined the country's nuclear status, state news agency KCNA reported.

"The utmost significance of legislating nuclear weapons policy is to draw an irretrievable line so that there can be no bargaining over our nuclear weapons," Kim said in a speech to the assembly, adding that he would never surrender the weapons even if the country faced 100 years of sanctions. A deputy at the assembly said the law would serve as a powerful legal guarantee for consolidating North Korea's position as a nuclear weapons state and ensuring the "transparent, consistent and standard character" of its nuclear policy, KCNA reported.

The 2013 law stipulated that North Korea could use nuclear weapons to repel invasion or attack from a hostile nuclear state and make retaliatory strikes. The new law goes beyond that to allow for preemptive nuclear strikes if an imminent attack by weapons of mass destruction or against the country's "strategic targets", including its leadership, is detected. That is an apparent reference to South Korea's "kill chain" strategy, which calls for preemptively striking North Korea's nuclear infrastructure and command system if an imminent attack is suspected. Kim cited kill chain, which is part of a three-pronged military strategy being boosted under the new South Korean president, Yoon Suk-yeol, as a sign that the situation is deteriorating and that Pyongyang must

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prepare for long-term tensions. ...

The law also bans any sharing of nuclear arms or technology with other countries, and is aimed at reducing the danger of a nuclear war by preventing miscalculations among nuclear weapons states and misuse of nuclear weapons, KCNA reported.

Analysts say Kim's goal is to win international acceptance of North Korea's status as a "responsible nuclear state." Joe Biden's administration has offered to talk to Kim any time, at any place, and the South Korean president, Yoon Suk-yeol, has said his country would provide massive amounts of economic aid if Pyongyang began to give up its arsenal. ...

Source: <https://www.theguardian.com/world/2022/sep/09/kim-jong-un-says-new-law-guarantees-north-korea-will-never-give-up-nuclear-weapons>, 09 September 2022.

### What Nuclear Weapons and Missiles is it Testing?

North Korea has declared itself to be a nuclear weapons state, passing a new law that enshrines the right to a pre-emptive strike to defend itself. The country's leader Kim Jong-un has ruled out the

possibility of any talks on denuclearisation. The last time North Korea tested a nuclear bomb was in 2017. The explosion at its Punggye-ri test site had a force, or "yield", of between 100-370 kilotons. A 100 kiloton bomb is six times more powerful than the one the US dropped on Hiroshima in 1945.

North Korea claimed this was its first thermonuclear device - the most powerful of all types of atomic weapon. ...Six underground tests have previously been carried out at Punggye-ri.

However, in 2018 North Korea said it would shut the site down, because it had “verified” its nuclear capabilities. Some of the tunnels into the site were subsequently blown up in the presence of foreign journalists. However, North Korea did not invite international experts to verify if it had been put beyond use.

Satellite images released earlier this year suggest work to renovate Punggye-ri had started. Any future nuclear testing at the site would breach resolutions from the United Nations Security Council. In 2018, North Korean leader Kim Jong-un made a promise to then-US president Donald Trump that North Korea would destroy all its nuclear material enrichment facilities. However, the UN’s atomic agency says satellite images suggest that North Korea had restarted the reactor which makes its weapons-grade plutonium.

The IAEA has also said that North Korea’s nuclear programme is going “full steam ahead,” with work on plutonium separation, uranium enrichment and other activities. North Korea has carried out more than 30 missile tests this year - using missiles with a long enough range to hit anywhere in the US. These include ballistic missiles, cruise missiles and hypersonic missiles. The ballistic missiles that North Korea has been testing include the Hwasong-14. It has a range of 8,000km - although some studies have suggested it could travel as far as 10,000km, making it capable of reaching New York.

It is the first of North Korea’s ICBMs. The more recent Hwasong-15 missile is believed to have a range of 13,000km, putting all of the continental US in its sights. In October 2020, North Korea unveiled the latest of its ballistic missile - the Hwasong-17. It is believed to have a range of

15,000km or more, meaning it could deliver a nuclear warhead to anywhere in the US. It could possibly carry three or four warheads, rather than only one - making it harder for a nation to defend

itself. The unveiling of the new missiles appeared to be a message to the Biden administration of the North’s growing military prowess, say experts. In March 2021, it carried out a launch of what it called a “new-type tactical guided projectile”, which it said was able to carry a payload of 2.5 tons - so capable of in theory of carrying a nuclear

warhead. Analysts at the James Martin Center for Nonproliferation Studies told Reuters that it appeared to be “an improved variant” of a previously tested missile, the KN-23....

Source: <https://www.bbc.com/news/world-asia-41174689>, 09 September 2022.

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**Touchstone told PAP, on the sidelines of the International Defence Industry Exhibition in the central town of Kielce, that all the elements of the US Patriot anti-ballistic missile defence system have been delivered to Poland.**

## **BALLISTIC MISSILE DEFENCE**

### **POLAND**

#### **Raytheon to Test Patriot System Components for Poland in October**

Checks on the integration of the components of the first Patriot missile battery for Poland will start in October, Caroline Touchstone, the director of the Patriot-Wisla programme at Raytheon Missiles and Defence, has announced. Touchstone told PAP, on the sidelines of the International Defence Industry Exhibition in the central town of Kielce, that

all the elements of the US Patriot anti-ballistic missile defence system have been delivered to Poland. She said that the first battery will consist of radars, power generators, combat control stations and components produced by Polish partners, including M903 launchers made by Huta Stalowa Wola.

The Patriot batteries will form the Wisla medium-range air/missile defence system in Poland. In 2018, the country signed an inter-governmental agreement with the US for the delivery of two batteries. In May this year, the Polish defence ministry announced the imminent purchase of six more Patriot systems. The Polish Patriot batteries are to be integrated into the IBCS air management system that is being developed for the US Army....

Source: <https://www.thefirstnews.com/article/raytheon-to-test-patriot-system-components-for-poland-in-october-32932>, 08 September 2022.

## NUCLEAR ENERGY

### JAPAN

#### Japan Plans to Restart Seven Nuclear Reactors by Summer 2023

In Japan, a major reversal last month, the government now wants to restart more nuclear power plants that were idled after the 2011 Fukushima disaster and is interested in expanding investments in next-generation plants. Weeks after the announcement, Japanese broadcaster NHK commissioned a new survey that revealed half of the population supports the government's initiative to expand nuclear power. NHK found that 48% of the respondents supported Japanese Prime Minister Fumio Kishida's plan of developing next-generation nuclear reactors as a reliable, clean energy power source in the country. About 32% opposed the plan, and another 20% were undecided.

The survey was conducted between Sept. 9-11 via random telephone conversations among 1,255

adults and came two weeks after Kishida announced plans to examine the construction of new plants that would break more than a decade of energy policy following the Fukushima disaster, which led to a decade-long effort to eliminate nuclear.

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Japan's energy policy is coming out of a decade of paralysis with increasing political and public support. The prime minister announced the restart of seven nuclear reactors across the country by the summer of 2023, bringing

the total number of operating power units to 17. Kishida's reasoning behind revisiting nuclear comes as Japan could face electricity supply problems due to soaring prices of natural gas and other energy products. ...

Besides Japan, California and Germany have recently announced plans to extend the life of nuclear power plants beyond the end of this year as the world faces a very dark winter amid a global energy crisis. ...The world appears to be more receptive to nuclear following the invasion of Ukraine. We should revisit our recommendation on Uranium from December 2020. Nuclear will

**The world appears to be more receptive to nuclear following the invasion of Ukraine. We should revisit our recommendation on Uranium from December 2020. Nuclear will sooner or later be accepted as one of the most stable "clean energy" sources of power in the green energy transition.**

sooner or later be accepted as one of the most stable "clean energy" sources of power in the green energy transition. Unlike solar, wind, and hydro, the world has figured out those renewable energy sources aren't as reliable as previously thought.

Nuclear will be a big winner as the world races to decarbonize power grids.

Source: ZeroHedge, <https://oilprice.com/Alternative-Energy/Nuclear-Power/Japan-Plans-To-Restart-Seven-Nuclear-Reactors-By-Summer-2023.html>, 14 September 2022.

**GERMANY**

**German Chancellor Rejects Calls to Reverse Nuclear Power Plant Closures**

The German Chancellor, Scholz, has rejected calls for his government to commit to a longer-term extension of the life of the country's nuclear power plants and insisted that Europe's largest economy would have enough energy to get through the winter. Scholz shut down criticism from the opposition conservative alliance and at least one leading economist, who have described his coalition's decision to keep two remaining reactors in emergency reserve rather than letting them produce electricity, as "madness" while the government refuses to reverse its long-term plan to close down the last remaining plants.

Criticism about the nuclear roadmap is also coming from within Scholz's government. His coalition partner, the pro-business FDP, has urged Scholz to overturn the 2011 ban on nuclear power introduced by Angela Merkel as a reaction to the Fukushima disaster. In a heated parliamentary debate, Scholz defended his government's strategy to tackle the energy crisis. Facing fierce criticism from the opposition, he said his government was confronting problems created by the previous administration under Merkel – in which he served.

The crisis, triggered by Russia's invasion of Ukraine, has been exacerbated in recent weeks by Moscow's reduction of gas supplies to Germany, which was followed a week ago by a complete halt. Moscow has cited maintenance issues linked to sanctions imposed by the west. Scholz accused Friedrich Merz's conservative

alliance (CDU/CSU) of refusing to accept responsibility for its role in the crisis, calling it "the party which holds complete responsibility for the fact that Germany made decisions to withdraw both from coal and from atomic energy, but never had the strength to enter into anything else". He also accused the conservatives of failing to embrace renewable energy and actively campaigning against it.

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...By trying now to save as much gas, electricity and oil as it can before winter kicks in – in part with the construction of LNG terminals and expanding renewable energy – Scholz said his government was "solving problems that the union failed to recognise as such when it was in power". Scholz said Germans would "rise above themselves" and deal with the coming winter with "with boldness and bravery" and said that Germany was close to its goal of becoming independent from Russian gas exports. Gas storage facilities were 86%

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full. Merz accused Scholz's economy minister, Robert Habeck, of "pandering to environmental lobbyists" and squandering the chance to find solutions to the energy crisis by seeking what he called a "lazy compromise" by refusing to allow Germany's three remaining nuclear power stations to continue operation for the next two

to three years.

Habeck had announced that two of them would remain "on standby" supported by the necessary staff, equipment and security, but would not be producing electricity unless needed. Merz said the decision was irresponsible, arguing that continuing running the plants would help secure energy supplies and that the increased electricity production would help control the market price.

In Bundestag debate, Alice Weidel, co-leader of the far-right AfD, accused the government of leading Germany to financial ruin with its policies, including a €65bn (£56bn) package announced, aimed to ease household finances. ...Amira Mohamed Ali, parliamentary leader of the far-left Die Linke, accused the coalition government of having "no social conscience". She urged the government to approach Russia in an attempt to bring it to the negotiating table and end its hostilities in Ukraine.

The instability of nuclear power is one of the main reason for not relying on it, the economics ministry argued when it presented its plans. Currently only 28 of 56 plants in France are on the grid, due in part to the shortage of cooling water linked to this summer's drought, meaning Germany has had to supply its neighbour with electricity....

Source: Kate Connolly, <https://www.theguardian.com/world/2022/sep/07/german-chancellor-rejects-calls-to-reverse-nuclear-power-plants-closure>, 07 September 2022.

## **SMALL MODULAR REACTOR**

### **ROMANIA-POLAND**

#### **Romanian-Polish Cooperation on NuScale SMR Deployment**

The MoU - signed on 6 September during the Economic Forum in Karpacz, Poland - aims at the exchange of experience and know-how, with a duration of 36 months, in the technical, economic, legal, financial and organisational fields for the development of SMR projects to be developed by Romania and Poland. The agreement

"involves a comprehensive approach to all activities in the development of an SMR project, from site selection to decommissioning, with the aim of developing robust, safe and cost-efficient SMR projects in Romania and Poland," the companies said.

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... The VOYGR nuclear power plant projects that both Romania and Poland will develop, in cooperation with NuScale, will have six modules, each with an installed capacity of 77 MWe. NuScale's SMR technology is the first to have gained

approval from the US Nuclear Regulatory Commission, in August 2020. NuScale offers VOYGR plants in 12, four and six-module configurations. Nuclearelectrica and NuScale are

cooperating with the US Trade and Development Agency on a series of engineering and design activities and studies, as well further technical analyses of the Doice'ti site, a former thermal power plant site which has been identified as a potential location for the SMR plant. The study, started in June, is expected to take eight months and cost USD28

**The study, started in June, is expected to take eight months and cost USD28 million in total, and with contributions from Nuclearelectrica and NuScale. According to Nuclearelectrica, the SMR plant will generate 193 permanent jobs in the plant, 1500 construction jobs, 2300 production jobs and will help Romania to avoid the generation of 4 million tonnes of CO2 per year.**

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In February this year, KGHM - which submitted an application to Poland's National Atomic Energy Agency on 8 July to evaluate the technology and prepare a site study - signed a definitive agreement with NuScale to initiate work towards deploying a first NuScale VOYGR SMR power plant in Poland as early as 2029. The first task under

that agreement will identify and assess potential project sites and develop project planning milestones and cost estimates....

Source: <https://www.world-nuclear-news.org/Articles/Romanian-Polish-cooperation-on-NuScale-SMR-deploy,07September2022>.

**USA**

**DOE Awards Research Funds for Offshore Nuclear Generation**

**Core Power, MIT Energy Initiative and the Idaho National Laboratory (INL) have been granted research funds by the US Department of Energy's (DOE's) Nuclear Energy University Program (NEUP) for a three-year study into the development of offshore floating nuclear power generation in the USA.** The DOE earlier announced its intention to fund and develop regional clean hydrogen hubs (H2Hubs) across the USA, one of which must be powered by nuclear. Funding would come from the USD1.2 trillion Bipartisan Infrastructure Law.

The hydrogen hub programme is a USD8 billion programme to bring together stakeholders to help drive down the cost of advanced hydrogen production, transport, storage, and utilisation across multiple sectors in the economy. In 2021, the DOE also launched the Hydrogen Shot to cut the cost of clean hydrogen to USD1 per 1 kilogram of clean hydrogen in one decade, referred to as '1-1-1'. UK-based Core Power said the NEUP funding will allow detailed collaborative research into the economic and environmental benefits of floating advanced nuclear power generation and take a granular look at all aspects of building, operating, maintaining and decommissioning such facilities.

...The DOE's Office of Nuclear Energy (NE) created

the NEUP in 2009 to consolidate university support under one initiative and better integrate university research within NE's technical programmes. NEUP engages US colleges and universities to conduct R&D, enhance infrastructure and support student education. The programme supports projects that focus on the needs and priorities of key NE programmes, including fuel cycle, reactor concepts and

mission-supporting research. The research will run in parallel to proof-of-concept prototype reactors currently being developed at INL. In November 2020, a multinational team including Core Power, Southern Company, TerraPower and Orano USA applied to take part in cost-share risk reduction awards under the DOE's Advanced Reactor Demonstration Programme to build a proof-of-concept for a medium-scale commercial-grade marine reactor based on molten salt reactor technology....

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Source: <https://www.world-nuclear-news.org/Articles/DOE-awards-research-funds-for-offshore-nuclear-gen,31August2022>.

**NUCLEAR COOPERATION**

**INDIA-RUSSIA**

**Nuclear Cooperation with Russia Continues for Kudankulam Power Plant**

Despite western sanctions on Russia, nuclear cooperation is going ahead. Atomash, a subsidiary of Russian nuclear energy giant Rusatom, has completed a milestone in manufacturing the steam generator for the fifth unit of the Kudankulam nuclear power plant. Preliminary, support components and 11,000 heat-exchange coils were completed inside the

steam generator. Specialists will now perform local heat treatment of welds and a full range of technical inspections, including hydraulic tests and eddy-current test of heat-exchange tubes. The steam generator is a heat exchange equipment, part of the reactor facility and belongs to the first safety class items. ...

Source: <https://www.tribuneindia.com/news/nation/nuclear-cooperation-with-russia-continues-for-kudankulam-power-plant-428843>, 05 September 2022.

## **MYANMAR–RUSSIA**

### **Myanmar Regime, Russia Sign Nuclear Cooperation ‘Roadmap’**

The Myanmar military regime and Russian state-owned nuclear corporation Rosatom have signed a roadmap for further atomic energy cooperation including the possible implementation of a modular reactor project in Myanmar. The agreement was signed on the sidelines of the Eastern Economic Forum (EEF-2022) in Vladivostok, Russia, where regime chief Min Aung Hlaing has been to attend the forum.

Rosatom said the document was signed by its director general Alexey Likhachev, and the regime’s Science and Technology Minister Myo Thein Kyaw and Electric Power Minister Thaug Han in the presence of Min Aung Hlaing. The Russian atomic energy agency said the roadmap would guide cooperation in the field of “peaceful use of atomic energy” for 2022-23. “In particular the document provides for the expanding of bilateral legal framework, possibility of implementing a small modular reactors project in Myanmar, as well as personnel training and work related to the improvement of public acceptance of nuclear energy in Myanmar” it said.

The regime’s mouthpiece newspapers said the countries would cooperate on the peaceful use of nuclear energy for socioeconomic development; conducting scientific activities and

research; manufacturing of pharmaceuticals; and industrial and other sectors including electricity generation. The agreement follows up on an MoU signed by Rosatom and the junta’s Science and Technology Minister Myo Thein Kyaw in Min Aung Hlaing’s presence during his previous trip to Russia in July “to lay a solid foundation for the development of further cooperation on practical projects”.

Min Aung Hlaing regime’s further pursuit of a nuclear deal with Russia comes at a time when Myanmar is in social and political disarray due to his military coup against the country’s democratically elected National League for Democracy government led by now detained

popular leader Daw Aung San Suu Kyi. Since the takeover, the junta has faced popular armed resistance against its rule and killed more than 2,000 people. ...

Source: <https://stratnewsglobal.com/neighbours/myanmar/myanmar-regime-russia-sign-nuclear-cooperation-roadmap/>, 08 September 2022.

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## **USA–POLAND**

### **Roadmap Report Reflects US-Poland Nuclear Cooperation Progress**

The USA and Poland have set out a detailed bilateral roadmap for the construction of six large nuclear reactors using US technology and a framework for strategic cooperation in civil nuclear energy. The Concept and Execution Report for Civil Nuclear Cooperation was delivered to Poland’s Minister of Climate and Environment Anna Moskwa in Warsaw by the USA, through the Department of Energy (DOE) and US Ambassador to Poland Mark Brzezinski, joined by Westinghouse Poland President Miroslaw Kowalik and Bechtel General Manager for Nuclear Power Ahmet Tokpinar.

The report, which fulfills an obligation under a 2020 intergovernmental agreement on nuclear energy cooperation, reflects more than 18 months



of intensive work and millions of dollars of US-funded analysis and assessments, the two nations said in a joint press release. It is supported by detailed studies by Westinghouse and Bechtel on the feasibility of AP1000 technology to deliver on the expectations of the Polish Nuclear Power Program and Polskie Elektrownie Jądrowe (PEJ), the investor in the construction of nuclear power plants in Poland. The final document has been reviewed by a bilateral steering committee co-chaired by Deputy Minister Adam Guibourgé-Czetwertyński from Poland's Ministry of Climate and Environment and DOE Assistant Secretary Andrew Light.

"The report is a major step towards Poland's development of a robust civil nuclear industry that is zero-carbon emitting and will result in another European source of energy that is free from Russian influence," US Secretary of Energy Jennifer Granholm said. The report will be taken into account by Poland's government when it takes key technology-related decisions this autumn, Moskwa said. "Nuclear power deployment in Poland will significantly contribute to socio-economic development and what recently became crucial due to the outbreak of Russia's aggression to Ukraine - to ensuring energy security," she added.

Poland plans to have nuclear power from about 2033 as part of a diverse energy portfolio, moving it away from heavy dependence on coal. PEJ has selected a site at Lubiatowo-Kopalino as the preferred location for the first of six large plants. In addition, several energy-intensive industrial companies are working towards upgrading plants to include small modular reactors, and high-temperature reactors for industrial heat production have since 2016 been included in the government's draft development strategy.

Source: <https://www.world-nuclear-news.org/>

*Articles/Roadmap-report-reflects-US-Poland-nuclear-cooperat, 13 September 2022.*

## URANIUM PRODUCTION

### UZBEKISTAN

#### **Clean Up of Two Uzbek Sites to Start in Early-2023**

The European Bank for Reconstruction and Development (EBRD) established the ERA in 2015 at the request of the European Commission, to tackle the legacy of Soviet uranium mining in region. The account, which became operational in 2016, is supported by contributions from the European Commission, Belgium, Lithuania, Norway, Spain, Switzerland and the USA. The grant agreement was signed on 1 September at the EBRD headquarters in London, UK, by EBRD Director of Nuclear Safety Balthasar Lindauer and Chairman of the State Committee for Ecology and Environmental

Protection of Uzbekistan Narzullo Oblomurodov. The grant will finance the remediation of the facilities at Yangiabad and Charkesar which are in mountains to the east of the Uzbek capital, Tashkent.

Located at an altitude of 1300 metres in an area with a high risk of seismic activity, and around

70km from Tashkent, Yangiabad was a uranium mining site for nearly 40 years. It is spread across a 50-square-kilometre area and contains about 2.6 million cubic metres of radioactive waste. Planned remediation works include closing four shafts, demolishing contaminated

buildings and processing facilities, relocating several waste rock dumps to a central covered dump and other associated activities. The village of Charkesar, located in the mountains 140km to the east of the Uzbek capital, was a uranium mining site until 1995 and is still home to approximately 3500 people. Planned remediation works at this site include the closure of two shafts

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and the demolition of abandoned buildings.

The works at the two sites are expected to begin in the first quarter of 2023 and will take approximately two years to complete. "On the basis of an impartial examination and a comprehensive environmental assessment of risks and local conditions, experts have chosen the safest and most suitable options and plans for carrying out reclamation, construction-installation, isolation and protection works of the area," the Uzbek State Ecology Committee said.

"Construction and rehabilitation works within the framework of the project will be carried out with the participation of local and German specialists," it noted. A EUR2 million grant agreement was signed in October 2021 for preparations for the environmental remediation of the Yangiabad and Charkesar sites. That grant was to support a recently established Project Management Unit (PMU) that will be dealing with the clean-up of the sites. As a first step, the PMU started preparing the necessary tender documentation for remediation works.

Central Asia served as an important source of uranium for the former Soviet Union. Uranium was mined for over 50 years and uranium ore was also imported from other countries for processing, and large amounts of radioactively contaminated material were placed in mining waste dumps and tailing sites. Most of the mines were closed by 1995 but very little remediation was done before or after the closure of the mining and milling operations. The contaminated material is a threat to the environment and the health of the population. The hazards include the possible pollution of ground and surface water in a key agricultural centre of the region. Work to manage the legacy wastes from historic uranium mining

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**The White House rejected linking a revival of the 2015 Iran nuclear deal with the closure of investigations by the U.N. nuclear watchdog, a day after Iran reopened the issue, according to a Western diplomat. Iran on Thursday (1 Sep) sent its latest response to a EU-proposed text to revive the agreement, under which it had restrained its nuclear program in exchange for relief from U.S., EU and U.N. economic sanctions.**

at sites in Shekaftar and Min-Kush in Kyrgyzstan was completed earlier this year. The work was completed on schedule and below the projected budget.

Uzbekistan is the world's seventh-ranking uranium supplier, according to World Nuclear Association, and was a significant source of Russian uranium supply until it gained independence in 1991. Japanese and Chinese joint ventures are active in uranium development in the country. In September 2018, an intergovernmental agreement was signed for construction by Rosatom of two VVER-1200 reactors to be commissioned about 2028, and an electricity generation strategy outlined by the Ministry of Energy in 2020 envisaged 15% of the Uzbekistan's electricity coming from nuclear by 2030....

Source: <https://www.world-nuclear-news.org/Articles/Cleanup-of-two-Uzbek-sites-to-start-in-early-2023>, 05 September 2022.

## NUCLEAR PROLIFERATION

### IRAN

#### US Rejects Linking Iran Nuclear Deal, IAEA Investigations

The White House rejected linking a revival of the 2015 Iran nuclear deal with the closure of investigations by the U.N. nuclear watchdog, a day after Iran reopened the issue, according to a Western diplomat. Iran on Thursday (1 Sep) sent its latest response to a EU-proposed text to revive the agreement, under which it had restrained its nuclear program in exchange for relief from U.S., EU and U.N. economic sanctions.

Then-U.S. President Donald Trump abandoned the deal in 2018 and reimposed U.S. sanctions, prompting Iran to start breaching the deal's

nuclear curbs and reviving U.S., Arab and Israeli fears it may be seeking an atomic bomb. Iran denies having nuclear ambitions. "There should not be any conditionality between reimplementation of the JCPOA and investigations related to Iran's legal obligations under the Non-proliferation Treaty," White House press secretary Karine Jean-Pierre said, referring to the deal formally known as the Joint Comprehensive Plan of Action. Jean-Pierre was alluding to investigations by the Vienna-based IAEA into uranium traces found at three undeclared Iranian sites. Resolution of the so-called safeguards investigations is critical to the U.N. agency, which seeks to ensure parties to the NPT are not secretly diverting nuclear material that they could use to make a weapon.

A senior U.S. official on August 23 said Iran had "basically dropped" some of the main obstacles to reviving the 2015 deal, including on the IAEA, but the issue seems to have been deferred. A Western diplomat who spoke on condition of anonymity said that Iran had reopened the issue in its latest response, which Tehran described as constructive, a characterization the United States disputed. Iran's foreign minister this week said the IAEA should drop its "politically motivated probes" of Tehran's nuclear work....

Source: <https://www.voanews.com/a/us-rejects-linking-iran-nuclear-deal-iaea-investigations/6729564.html>, 025 September 2022.

### **Senior Israeli Official: Iran Talks are Dead, Time to Start Discussing a New Deal**

A senior Israeli official called on Europe and the US to begin talking about demands for a "longer, stronger" nuclear agreement with Iran, saying current talks aimed at reviving a 2015 pact were dead after Jerusalem provided proof that Tehran had not been forthright during negotiations. The official, traveling with Prime Minister Yair Lapid's

delegation to Berlin, spoke to reporters hours after the premier said he passed German Chancellor Olaf Scholz "sensitive and relevant intelligence information" on Iran's nuclear program, and a day after Germany, France, and the United Kingdom

issued a statement expressing "serious doubts" over Iran's sincerity in seeking a nuclear agreement. ...

Senior Israeli officials have been holding intensive

contacts with counterparts in Europe and the US in recent weeks to try to convince them to back away from reviving the 2015 agreement. Lapid told his cabinet that Israel had given the Europeans "up-to-date intelligence information on Iranian activity at the nuclear sites," and last week, the Prime Minister's Office said Mossad chief David Barnea had also given American officials unspecified intelligence. Scholz indicated that the sides were at loggerheads over Iran's refusal to budge on certain terms. ... A major sticking point

had been Tehran's insistence that the UN's IAEA drop a probe into unaccounted for traces of enriched uranium at three sites in Iran, which the agency and the West have rebuffed out of hand.

The nuclear watchdog said in a report that it "cannot assure" the peaceful nature of Tehran's nuclear program. Iran reaffirmed its "readiness" to cooperate with the International Atomic Energy Agency. "Everyone has their own excuse," the Israeli official said. "Some say the Iranian response, some say [EU Foreign Affairs head Josep] Borrell and [Borrell's chief of staff Enrique] Mora were getting ahead of themselves, some say the Americans decided to toughen up after the dialogue with the Israelis." The official indicated that Robert Malley, US President Joe Biden's envoy to the indirect talks and a frequent target of Israeli criticism, had been shunted to the side.

... A US State Department spokesperson denied to *The Times of Israel* that Malley had been pushed to the side or that the US position had hardened, saying that efforts to return to the JCPOA were

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**A US State Department spokesperson denied to *The Times of Israel* that Malley had been pushed to the side or that the US position had hardened, saying that efforts to return to the JCPOA were ongoing.**

ongoing. "We have a very close dialogue with Israel and other allies and partners about Iran, including the JCPOA. Special Envoy Malley is an integral part of those talks.

It is not correct that our position has 'toughened,'" the spokesperson said. "There is only one reason that we have not yet reached an understanding: Tehran has not yet accepted the reasonable basis presented by the EU as coordinator of JCPOA talks," they added.

Israel has long opposed a revival of the 2015 accord, which has been moribund since then-US president Donald Trump unilaterally withdrew in 2018 and reimposed biting sanctions on Tehran. The administration claimed at the time that it would negotiate a better deal with Iran, but that effort never advanced. Many of the US demands, such as clamping down on malign Iranian activities abroad, dovetailed with Israeli complaints about the 2015 JCPOA's failings, but fell outside what Iran and much of the international community considered to be the scope of a possible deal. ...

*Source: Lazar Berman, and Jacob Magid, <https://www.timesofisrael.com/senior-israeli-official-iran-talks-are-dead-time-to-start-talking-about-a-new-deal/>, 12 September 2022.*

## **NUCLEAR NON-PROLIFERATION**

### **GENERAL**

#### **NPT 'Remains Vital', Fresh Push on Sharing Nuclear Tech for Peaceful Uses**

**UN Secretary General Guterres has expressed his disappointment at the inability of the Tenth Review Conference of the Parties to the Treaty on the NPT to reach consensus but welcomed**

**the fact that the conference recognised the NPT as the "cornerstone" of the global disarmament and non-proliferation regime. Meanwhile more**

**than 30 countries are establishing a Sustained Dialogue on expanding access to peaceful uses of nuclear technology.**

Coming into force in 1970 and made permanent in 1995, the NPT is a deal by which countries that held nuclear weapons before 1968 promised to take steps towards permanent disarmament, while nations without atomic weapons promised not to develop them. It also seeks to promote the safe sharing of nuclear technology for peaceful purposes.

A total of 191 states have joined the NPT, including the five nuclear-weapon states (China, France, Russia, the UK and the USA). The IAEA is charged with the responsibility of verifying the compliance of the non-weapons states, as well as aiding them in the peaceful uses of nuclear energy. The

NPT allows for the parties to gather every five years to review its operation. The tenth such review was held at the United Nations headquarters in New York from 1 August to 26 August.

The President of the review conference, Ambassador Gustavo Zlauvinen, said that there had been progress made despite his disappointment at the failure to agree a consensus outcome, after Russia objected to the wording about Ukraine's Zaporizhzhia nuclear power plant, which its military currently controls. He said that the establishment of a working group to look at strengthening the review mechanism of the treaty was something which many

**UN Secretary General Guterres has expressed his disappointment at the inability of the Tenth Review Conference of the Parties to the Treaty on the NPT to reach consensus but welcomed the fact that the conference recognised the NPT as the "cornerstone" of the global disarmament and non-proliferation regime. Meanwhile more than 30 countries are establishing a Sustained Dialogue on expanding access to peaceful uses of nuclear technology.**

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delegations had tried to get established for many years. He said that getting agreement on the working group was a “meaningful achievement”.

Efforts to get an agreement on a consensus document - despite the difficult geopolitical backdrop and differences between some non-nuclear states and nuclear states on progress on disarmament... But Russian Deputy Permanent Representative to International Organisations in Geneva, Andrey Belousov, said the “conference became a political hostage” of parties who wanted to use the “conference to settle scores with Russia”, according Russia’s TASS news service.

The USA’s State Department said that “despite Russia’s cynical obstructionism the fact that all the other remaining State Parties were able to support the final document speaks to the treaty’s essential role in preventing nuclear proliferation and averting the danger of nuclear war”. The statement added that the NPT remains “essential to advancing the peaceful uses of nuclear energy”.

The UK’s representative to the conference, Aidan Liddle, said that “we cannot escape the fact that there are deep divisions, in this Treaty and in the world”, adding that the NPT “makes a vital and integral contribution to international peace and security”. He said the UK would “do its part” by “establishing, with the United States and 30 other partners who have joined so far, the Sustained Dialogue on expanding access to the peaceful uses of nuclear technologies”. Ambassador Zlauvinen, in an interview for the *World Nuclear News* podcast, said that one of his goals for the

review conference was to ensure that the peaceful sharing of nuclear technology was treated on an equal footing with the other NPT pillars of disarmament and non-proliferation of weapons.  
...

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Source: <https://www.world-nuclear-news.org/Articles/NPT-remains-vital-fresh-push-on%C2%A0sharing-nuclear-te>, 31 August 2022.

### **USA–RUSSIA**

#### **Russia, US Agreement on Need for New START Successor a ‘Glimmer of Hope’**

Russia and the US committed to start discussions on a successor to the New START Treaty – due to expire in 2026 – a move welcomed by CND. The statement was agreed during the review conference of the NPT in New York in August. The agreed statement, which was included in the final draft text of the NPT conference said: “The Russian Federation and the United States commit to the full implementation of the New START Treaty and to

pursue negotiations in good faith on a successor framework to New START before its expiration in 2026, in order to achieve deeper, irreversible, and verifiable reductions in their nuclear arsenals.”

Both President Biden and President Putin expressed the need for a fresh nuclear arms control agreement in

**Both President Biden and President Putin expressed the need for a fresh nuclear arms control agreement in order to prevent a nuclear war on the first day of the month-long conference. However, within a week of the statement, Moscow notified Washington that it had temporarily suspended mutual on-site inspections of each other’s nuclear weapons facilities.**

order to prevent a nuclear war on the first day of the month-long conference. However, within a week of the statement, Moscow notified Washington that it had temporarily suspended mutual on-site inspections of each other’s nuclear weapons facilities. While Moscow also blocked the final consensus on the NPT’s final outcome document over its opposition to wording which supported the need for Ukraine to control of the

Zaporizhzhia nuclear power plant, the agreement on the need for a successor to New START was welcomed by 151 of 190 states-parties who attended the summit. CND General Secretary Kate Hudson said: "The threat of nuclear war will never go away as long as the nuclear weapons states continue to possess their arsenals. This agreement on the need for a successor to New START offers a glimmer of hope towards greater dialogue and action on nuclear disarmament."...

Source: <https://cnduk.org/russia-us-agreement-on-need-for-new-start-successor-a-glimmer-of-hope-says-cnd/>, 09 September 2022.

## **NUCLEAR SAFETY**

### **SWEDEN**

#### **Restart of Damaged Swedish Nuclear Reactor Delayed Until 2023**

Repair works on one of Sweden's six remaining nuclear reactors have been delayed by two months to January 31, 2023, the plant's owner, energy company Vattenfall, said. Two weeks ago, the company announced that a vital component of the Ringhals 4 reactor had been damaged in connection with annual maintenance and that it would be up and running by November 30. Now, it will not be restarted until well into the winter, in a further setback to power supply amid the Europe-wide energy crunch, Xinhua news agency reported. ...

The reason for the delay is that the replacement of the damaged pressure vessel is more complicated than previously communicated, Ringhals said in a statement according to which

**The reason for the delay is that the replacement of the damaged pressure vessel is more complicated than previously communicated, Ringhals said in a statement according to which more than 100 Ringhals employees are involved in developing work methods and producing special tools and spare parts. A full-scale model of the nearly 13-metre high-pressure vessel is being built to test the tools and rehearse the operation.**

more than 100 Ringhals employees are involved in developing work methods and producing special tools and spare parts. A full-scale model of the nearly 13-metre high-pressure vessel is being built to test the tools and rehearse the operation. "The pressure vessel is radioactive, all work is carefully prepared, and practicing in a test environment helps us work safely and efficiently when we are ready to carry out the actual repair work," Linde said in the statement. "We have a big job ahead

of us, but the motivation is strong because nuclear power is in demand in southern Sweden. All available resources are being used to get Ringhals 4 back into operation," he added.

The decommissioning of several reactors in 2017-2020 has left Sweden with three nuclear power plants with a total of six reactors that produce

around 30 per cent of the country's electricity output, according to the Swedish Radiation Safety Authority (SSM). When the news of the damaged reactor first emerged in August, experts said that it would have a major impact on electricity prices in Sweden, especially in the more densely populated south. ...

**An IAEA team of experts said the operator of the UAE Barakah Nuclear Power Plant (NPP), the first NPP in the Arab region, had strengthened operational safety by fully addressing the findings of an initial IAEA safety review mission five years ago. In order to ensure continuous enhancements also in the future, the team encouraged the Barakah NPP to continue to use the IAEA's nuclear safety review services.**

Source: <https://www.daijiworld.com/news/newsDisplay?newsID=999704>, 14 September 2022.

### **UAE**

#### **IAEA Sees Strengthened Operational Safety at UAE's First Nuclear Power Plant, Encourages Continued Improvement**

An IAEA team of experts said the operator of the UAE Barakah Nuclear Power Plant (NPP), the first NPP in the Arab region, had strengthened

operational safety by fully addressing the findings of an initial IAEA safety review mission five years ago. In order to ensure continuous enhancements also in the future, the team encouraged the Barakah NPP to continue to use the IAEA's nuclear safety review services.

The Operational Safety Review Team (OSART) concluded a five-day follow up mission to the Barakah NPP. The mission, which focused on Unit 1 of the plant, was carried out at the request of the Government of the UAE to evaluate progress in addressing the findings of the IAEA's pre-OSART mission that took place in 2017, three years prior to the start of operations in 2020.

...The plant, owned by the Emirates Nuclear Energy Corporation (ENEC), is located in the Al Dhafra region of Abu Dhabi Emirate in the UAE, 280 km west of Abu Dhabi city. Two 1400 MW pressurized water reactors have been operational since 2020 and 2021. The third unit is due to start up in coming months, with all four units due online by 2025. The operator is Nawah Energy Company, a joint venture between ENEC and Korea Electric Power Company (KEPCO), which is also the prime contractor for the Barakah plant.

...The five-member team comprised experts from Finland, Hungary and the United Kingdom, and two IAEA officials. ... The team observed that all findings from the 2017 review were resolved including:

- The plant has enhanced the effectiveness of its management in-field programme.
- The plant has improved its operating experience programme.
- The plant has established a comprehensive accident management programme and demonstrated the capability of the mobile equipment under simulated severe accident conditions.

...The team provided a draft report of the mission to the plant management. They will have the opportunity to make factual comments on the draft. These comments will be reviewed by the IAEA and the final report will be submitted to the Government of UAE within three months....

*Source: <https://www.iaea.org/newscenter/pressreleases/iaea-sees-strengthened-operational-safety-at-uaes-first-nuclear-power-plant-encourages-continued-improvement>, 09 September 2022.*

## **UKRAINE**

### **Situation at Zaporizhzhya Nuclear Power Plant 'Untenable,' Protection Zone Needed, IAEA's Grossi tells Board**

**This situation is untenable, and we are playing with fire. We cannot continue this situation where we are one step away from a nuclear accident. The safety of Zaporizhzhya Nuclear Power Plant is hanging by a thread." Initial consultations with Ukraine and Russia to establish a protection zone have begun.**

In his opening address to the IAEA's Board of Governors today (12 Sep), IAEA Director General Rafael Mariano Grossi reiterated his call for the establishment of a nuclear safety and security protection zone at Zaporizhzhya Nuclear Power Plant in Ukraine. Mr

Grossi described the precarious situation at the plant caused by weeks of shelling in the area that has damaged vital power infrastructure and prompted operators to put the last reactor into shutdown.

He told the 35-member Board: "This situation is untenable, and we are playing with fire. We cannot continue this situation where we are one step away from a nuclear accident. The safety of Zaporizhzhya Nuclear Power Plant is hanging by a thread." Initial consultations with Ukraine and Russia to establish a protection zone have begun, he added.

At the end of August, Mr Grossi led the IAEA Support and Assistance Mission to Ukraine's Zaporizhzhya Nuclear Power Plant (ISAMZ). The mission established a continuous IAEA presence at the site to help ensure nuclear safety and security; it also allowed inspectors to complete

vital safeguards activities. Mr Grossi said that, based on the evaluation of all safeguards relevant information available to the IAEA, the Agency had found no indication that would give rise to a proliferation concern....

Source: <https://www.iaea.org/newscenter/news/situation-at-zaporizhzhya-nuclear-power-plant-untenable-protection-zone-needed-iaeas-grossi-tells-board>, 12 September 2022.

### Zaporizhzhia Nuclear Plant: UN Experts Make First Inspection

UN nuclear experts have made their first inspection of the Russian-held Zaporizhzhia power plant in Ukraine and are to maintain a presence there. IAEA chief Grossi said the "plant and physical integrity of the plant" had been "violated several times". The inspectors were accompanied to the plant by Russian soldiers after a risky journey delayed by shelling. Russia and Ukraine accused each other of trying to sabotage the mission.

Zaporizhzhia... was occupied by Russia soon after it invaded Ukraine in February. Ukrainian staff who continue to operate the plant say Russian troops have used it as a military base and that workers are in effect held at gunpoint. "We are not going anywhere. The IAEA is now there, it is at the plant and it is not moving - it's going to stay there," Mr Grossi said, once he had crossed back into Ukrainian-held territory. But he did not specify how many people would be staying and for how long. Russia's Interfax news agency reported that around eight to 12 inspectors would stay on, while Ukraine's state nuclear company Energoatom said five inspectors would stay. The inspectors hope to assess the state of the plant and talk to Ukrainian workers under Russian control. Mr Grossi said that battles taking place near the plant were "not going to stop" the inspection. "There were

moments where fire was obvious, heavy machine gun, artillery mortars, at two or three times [it was] really very concerning, I would say, for all of us," he said.

... During his nightly address, President Zelensky said he hoped the inspectors would "draw objective conclusions," but lamented the absence of international journalists among the delegation. "We have clear evidence that Russia did a lot of cynical things to deceive the mission," he added. "The occupiers forced people to lie to the IAEA representatives - to hand over some papers, sign something, say something." Meanwhile, Mr Zelensky's chief of staff accused Russia of trying to "wreck" the mission by shelling the nearby town of Enerhodar, which is under Moscow's control, and the facility. "Criminals must be stopped," Andriy Yermak wrote on Telegram, accusing Russia of acting like a "terrorist state". Russia refuted this, stating that 60 Ukrainian "saboteurs" who attempted to recapture the plant by crossing the river were killed. The EU is giving more than five million anti-radiation tablets to Ukraine, as fears grow of an accident

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at the plant. While recent fighting in the area has caused some damage to the plant, so far there has not been any recorded increase in radiation levels in the area....

Source: <https://www.bbc.com/news/world-europe-62757024>, 01 September 2022.

### IAEA Grossi Calls for Establishment of Nuclear Safety and Security Protection Zone at Zaporizhzhya NPP

The establishment of a Nuclear Safety and Security Protection Zone at the Zaporizhzhya Nuclear Power Plant (NPP) in Ukraine is urgently needed to ensure that the physical integrity of the plant is not compromised, Director General Grossi told the UN Security Council. Zaporizhzhya



NPP has been controlled by Russian forces since March but is operated by its Ukrainian staff.

In a session discussing threats to international peace and security, Mr Grossi outlined findings and recommendations from the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ), released in its *Nuclear Safety, Security and Safeguards in Ukraine: 2nd Summary Report*.

Stressing the need for a protection zone, including an end to the shelling around the plant, he explained that the first important safety pillar that exists in any nuclear facility is not to violate its physical integrity. Mr Grossi said that unfortunately “this has happened and this continues to happen,” adding that “we are playing with fire and something very catastrophic could take place.”

Mr Grossi told the Security Council that the IAEA through ISAMZ now has a continuous presence at Zaporizhzhya NPP, with personnel on the ground at the plant providing first-hand neutral, impartial and technical information on the site’s status. Pointing out the value of the Agency’s continued presence at the plant, he said this provided the IAEA, and through it, the United Nations and the international community with the capacity to have a direct, immediate evaluation of the situation on the ground as it may happen.

... Mr Grossi stressed that the seven indispensable pillars for ensuring nuclear safety and security at Zaporizhzhya NPP must be maintained and detailed the IAEA’s recommendations to address

violations of these pillars. Mr Grossi explained how ISAMZ had observed that operators at the plant were performing important safety and

security tasks under extremely challenging circumstances, with military equipment and vehicles present on the site. With the second pillar stating that all safety and security systems and equipment should be fully functional, he recommended that the military vehicles and equipment on the site be

removed so as not to interfere with normal operation of the nuclear safety and security systems.

Under the third pillar, which requires operating staff to be able to fulfil their safety and security duties without undue pressures, Mr Grossi said that this is something that has been addressed time and again during this crisis and especially since the nuclear power plant was occupied last March. He recommended that the operator

should be allowed to return to its clear and routine lines of responsibilities and authorities, and that an appropriate work environment be re-established, including with proper family support for the staff.

Mr Grossi stressed the crucial importance of pillar four, which states that there must be secure off-site power supply from the grid, stating that: “A nuclear power plant

without external power supply may lose crucial functionalities including the cooling of the reactors and the spent fuel. Without this we could have a very serious nuclear accident.” He recommended that off-site power supply line

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redundancy be re-established and available at any time, and said that for this to be possible, "all military activities that may affect the power supply systems must be stopped immediately."

Referring to the fifth pillar, which requires uninterrupted logistical supply chains and transportation to and from the sites, Mr Grossi explained that the Zaporizhzhya NPP is "a large industrial site requiring a constant flow of spare parts and other equipment — a situation that is of course abnormally interrupted now." He recommended that all the parties should commit and contribute to ensuring effective supply chains, highlighting that IAEA assistance and support programmes can help in re-establishing a flow of supplies.

Pillar six refers to the functioning of radiation monitoring systems, and Mr Grossi recommended that the site should continue ensuring this functionality, including by trainings and exercises, which he said the IAEA can help in ensuring. Finally, Mr Grossi highlighted that pillar seven states that there must be continued and reliable communications with the regulator and with others. "We have seen repeatedly that these lines of communication have been interrupted," he said. He recommended that reliable and redundant communication means and channels be secured at all times. ...

Source: <https://www.iaea.org/newscenter/news/un-security-council-iaea-grossi-calls-for-establishment-of-nuclear-safety-and-security-protection-zone-at-zaporizhzhya-npp>, 07 September 2022.

## **NUCLEAR WASTE MANAGEMENT**

### **SWITZERLAND**

#### **Site Proposed for Swiss Repository**

Following a 14-year site selection process, Switzerland's national radioactive waste disposal cooperative Nagra has proposed Nördlich Lägern

in northern Switzerland as the site of a deep geological repository. A used fuel encapsulation plant is to be built at the existing Zwiilag interim storage facility. Six sites were proposed in November 2011 during the first stage of the process - which began in 2008 - for selecting sites for two repositories: one for low- and intermediate-level waste (LLW/ILW), the other for high-level waste (HLW). The repository for LLW/ILW is planned to be in operation by 2050, with the one for HLW planned to be operational ten years later.

Stage two of the site selection process, which began in late 2011, aimed to narrow down the sites under investigation to at least two for each

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of the repositories. Nagra proposed in January 2015 that further investigations be carried out at the proposed siting regions of Zürich Nordost and Jura Ost in the third and final stage of the selection process. It said the four other regions under consideration in the

second stage - Südranden, Nördlich Lägern, Jura-Südfuss and Wellenberg - would be placed in reserve. However, in December 2016, the Swiss Federal Nuclear Safety Inspectorate (ENSI) proposed that the Nördlich Lägern region also be included in the final stage.

Following the completion of the second stage of the site selection process, the Federal Council made the decision at a meeting in November 2018 to include the Nördlich Lägern region in further investigations. In addition, the regions of Jura-Südfuss, Südranden and Wellenberg remain reserve options.

Nagra has now proposed that Nördlich Lägern should host a combined repository that is suitable for all types of radioactive waste. The entrance to the repository, the so-called surface facility, would be constructed in the Haberstal area in the community of Stadel in canton of Zürich. Nagra said its investigations showed that it was possible to construct a safe deep geological repository in all three siting regions - Jura Ost, Nördlich Lägern

and Zürich Nordost. However, the Opalinus Clay in Nördlich Lägern offers the greatest geological barrier effect, the best stability of the rock layers and a high degree of flexibility for the layout of the underground repository in comparison with the siting regions Jura Ost and Zürich Nordost. Nagra has also decided not to build the fuel element packaging facility in the siting area itself, but on the site of the existing Zwiilag interim storage facility in Würenlingen in the can-ton of Aar-gau, adjacent to the Paul Scherrer Institute.

Most of Switzerland's HLW is currently held in transport and storage casks at the Zwiilag facility, with a smaller percentage at the interim storage facility at the Beznau nuclear power plant (Zwibez). Before its emplacement in the planned deep geological repository, the waste will be transferred to smaller disposal canisters in the encapsulation plant.

Nagra said it will now prepare the general licence applications for the repository and the encapsulation plant, which it expects to submit to the Federal Council in 2024. The authorities and the federal government will review these applications before the Federal Council and parliament make their decisions. This approval, expected around 2030, will be subject to an optional referendum, with the Swiss voters having the final say. Nagra said it is likely to be another 30 years or so before it can start waste emplacement operations. ...

Source: <https://www.world-nuclear-news.org/Articles/Site-proposed-for-Swiss-repository>, 12 September 2022.

## **USA**

### **Deep Isolation Aiming for Disposal Site within Decade**

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Elizabeth Muller, CEO and co-founder of Deep Isolation, says that the firm is targeting having a first deep borehole nuclear waste disposal site up and running within "five to ten years". Muller, in an interview for the *World Nuclear News* podcast, said that a combination of

the need to tackle climate change and the geopolitics of energy means "more and more countries are eager to move forward with new nuclear power" with an "increasing urgency for solving the waste problem". The traditional 50 to 100 year time frames for disposal (rather than storage) of nuclear waste is changing, she said, with a number of locations around the world "now

interested in seeing nuclear waste disposal happen in that five to ten year time frame. So that's who we're working with ... I'm very confident that within the next decade we will have a disposal site that is up and running. I'm targeting five years for first disposal somewhere in the world".

**Deep Isolation's system is to use directional borehole disposal of nuclear waste, building on some of the "incredible innovations that have taken place in the past 20 to 30 years in the drilling industry where it's now inexpensive and routine to go down three quarters of a kilometre in depth and to have horizontal sections two, three or four kilometres in length".**

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Berkeley, California-based Deep Isolation's solution for the management of used nuclear fuel and high-level radioactive waste involves emplacing it in corrosion-resistant canisters placed in deep horizontal drillholes. The

technology uses existing directional drilling technology. The waste can be retrieved during a determined time frame or permanently secured. In 2019, Deep Isolation publicly demonstrated its concept when it successfully placed and then retrieved a prototype nuclear waste canister hundreds of metres underground via a borehole.

The horizontal storage means that the waste can be disposed of in suitable geological conditions in many different places, including close to, or at proposed or existing sites where the waste is produced, Muller says: "If you're looking at only 500 metres of depth, it's harder to find a good location. If you're looking at 1000 metres, it's significantly easier to find a good location, and if you're looking at 1.5 kilometres or even deeper then I think most locations would probably qualify. We will, of course have to do a detailed analysis and study and testing to make sure ... it meets the requirements for safety and environmental protection."

A further advantage of horizontal storage, she says is: "You can get more storage space for a given depth. You can follow a particular rock formation. There's no direct potential pathway through the vertical shaft to the surface and it's also easier to retrieve waste. You can retrieve waste potentially in vertical holes as well, but you need a structure because waste is so dense that it can compact and crush any structure that it's in whereas when you're horizontal, you don't have that problem, it's just laid out end-to-end."

If it is permanent, how long would it be necessary to make the waste retrievable? "So for how long it's required is a bit of a grey zone for mined repositories, most people think it is 50 years that it needs to be retrievable, but it is usually just the amount of time that the repository is open, so it is very possible that for borehole disposal it will only need to be retrievable for a couple of years as opposed to 50 years, and we think retrievability

will be pretty straightforward for 20 years."

She said there are ways to have retrievability for up to 100 years "if you really want it, but I think the question is how long do you really want it for, and I think five to twenty years is probably going to be sufficient".

Muller, who was an environmentalist and climate change expert and academic before starting Deep Isolation, said the motivation for the business was her concern "that the things we are talking about doing when it comes to climate change aren't enough ... if we really want to stop climate change, we have to do bigger things and that led to my interest in nuclear power".

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"I think the industry has done a very good job of explaining why that shouldn't be a barrier to the future of nuclear and yet the public has not really been receptive to talking about how safe it is now and how little waste there is compared to other industries. And so it seemed to me, let's just solve the nuclear waste problem. It can't be that hard ... it's the responsible thing to do anyway."

The drilling itself could take a matter of months "so we are not talking about 20 to 30 years to build a repository" with emplacement also taking a matter of months. "Because we're using smaller holes, we don't need people underground. We don't need air underground. This means that we can go deeper than is possible in mined repositories," she explains. She estimates that once there is a customer and a location it might take three years to get through the licensing process, but she hopes that will "get easier and faster for second locations and third locations ... so we're really looking three to five years to waste disposal from the time that we have a government and location that are interested in disposal."

A new nuclear power plant, with a lifetime of about 50 years, would need about 15 boreholes, she estimates. The company is talking to countries

taking steps into new nuclear as well as new advanced reactor developers about adopting deep borehole disposal. A key part of work is meeting with communities in areas which have nuclear power plants. One of the challenges faced by past efforts to choose sites for permanent disposal of nuclear waste has been finding a site which was acceptable to communities. Muller says that their research and public engagement has found that people object to nuclear waste being brought into their community or the idea of hosting a national repository, but if they already have some waste there then they tend to be open to the idea of disposing of the waste at the location where it already is. She says their system is modular so can be put at the reactor site itself "which I think solves one of the biggest problems" governments

have faced with disposal - "the reluctance to bring nuclear waste into someone's backyard".

Last month Deep Isolation signed a Memorandum of Agreement with technical and engineering services provider Amentum to cooperate on the commercialisation of its radioactive waste disposal technology around the world. The companies said initial targets for joint work include countries in Europe and the Pacific that "represent a combined addressable market for geologic disposal of spent fuel and high-level waste worth more than USD30 billion" ....

*Source: <https://www.world-nuclear-news.org/Articles/Deep-Isolation-aims-for-disposal-site-within-decad>, 05 September 2022.*



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