



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

OPINION – Sitakanta Mishra

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### The Nuclear Panacea for India's Food Security

By the year 2030, around 600 million people will not have access to adequate food, whereas every year approximately 1.3 billion tons of food is lost or wasted globally which is one-third of the total food produced. According to Global Network Against Food Crises (GNFAC) report, around 193 million people in 53 countries experienced an acute food crisis in 2021. Despite some global efforts led by the United Nations, there has not been much progress in curbing food wastage which is very rampant in lower- and middle-income countries like Brazil, China, India, etc. To prevent a looming food crisis on a global scale, innovative actions are warranted and nuclear technology can be the panacea.

Given India's ambitious economic growth plan and growing population, food wastage is undoubtedly a drag on government food security plans and a national burden that India needs to address on a war footing. The problem has reached an alarming stage today where an average person in India wastes around 137 grams of food per day, i.e., 0.96 kg per week, or 50 kg per year. As a result, 40% of the food is wasted in India which is equivalent to Rs 92,000 crores per year.

Most of the wastage occurs at two stages: first, at the production stage which is called 'food loss',

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which largely happens during production, handling, storage, and processing; second, at the consumption stage which is called 'food wastage' where consumption ready food is discarded because of expiration. In addition, crop failures, low yield, and crop loss due to pest infestation are other major causes of

food loss. Therefore, any remedial measure to address food loss or wastage must take into account, the security of production and distribution, in other words, advanced agricultural practice with technological intervention besides nurturing food-best-use-culture in every household.

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The application of nuclear technologies in India's agricultural practice can be the panacea in solving the food loss problem to a great extent. These can be achieved through large scale application of scientific agricultural practice, especially making available mutation breeding seeds and radiation processing technologies. The BARC has developed 42 high-yielding seed varieties by inducing mutations and cross-breeding through Gamma irradiation for commercial exploitation. In addition, cost-effective food irradiation technology can be used for shelf-life extension of food crops (pulses, cereals, and oil seeds), delay ripening and disinfestations of fruits, and sprouting inhibition of potato and onion, reduce of number microorganisms in spices, etc. However, a handful of high-yielding seeds are in use, and only 15 Food Irradiation Plants are in operation in the country of 1.2 billion population.

Evidence suggests that employing irradiation technology can improve yield by 10-40 per cent for potatoes, 10-12 per cent for rice, 10-15 per cent for corn and wheat and 7-15 per cent for Barley. Another problem where radiation technology can make a big difference is pest control. As per the UN's Food and Agriculture Organisation (FAO), approximately 40 percent of global agricultural crops are lost every year due to pests. The Sterile Insect Technique provides a safe, environment-friendly option for pest control that can significantly minimize crop losses. The technique involves mass sterilization of insects through radiation. The sterilized pests are then

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**The Sterile Insect Technique provides a safe, environment-friendly option for pest control that can significantly minimize crop losses. The technique involves mass sterilization of insects through radiation. The sterilized pests are then released in the area and mate with the wild insects resulting in a decline in the population of pests. The technique not only helps in controlling the pest population, but it also eliminates the environmental harm caused by excessive use of pesticides by farmers.**

released in the area and mate with the wild insects resulting in a decline in the population of pests. The technique not only helps in controlling the pest population, but it also eliminates the environmental harm caused by excessive use of pesticides by farmers. Furthermore, nuclear technology is also being used to determine soil quality to enable more efficient soil management. Soil moisture neutron probe, a technique to measure the moisture, has proven to be much more effective than conventional sensors, enabling farmers to optimize irrigation as per the soil's needs.

This suggests that there is enormous scope for aggressive public outreach to popularize the availability of required technology, methods, and benefits, which is the need of the hour. India has already embarked on such applications in the agricultural sector but the progress has been very slow. The DAE has set up two radiation technology demonstration units, operated by the Board of Radiation and Isotope Technology. In order to leverage nuclear technology in agriculture at scale for marked improvement, much more concerted efforts are required, both by the government and private sector. In 2020, the government announced much-needed reforms for opening up the nuclear sector for private players in the fields of medicine, agriculture and research. As such, there is an opportunity for India's start-up ecosystem to undertake initiatives in the use of nuclear/radiation technology in the agricultural sector.

Though the Indian nuclear establishment has already made its best efforts in preparing the irradiation technology and modalities of its application, roping in the private sector and start-ups to promote their application in the agricultural sector would immensely help to allay the fears persisting at the societal level and expedite their acceptance on the ground. Leveraging global innovations and expertise in the field of radiation technology is not only crucial in ensuring India's food security but also, in turn, will increase farmers' income.

In addition, wide adoption of radiation technology in agriculture will help eliminate unsustainable conventional agricultural practices that are detrimental to the environment, such as over-irrigation and heavy use of pesticides. For making agriculture more sustainable and reduce wastages, and in turn to ensure national food security, nuclear technology's transformational role India must master smartly.

Source: <https://timesofindia.indiatimes.com/blogs/voices/the-nuclear-panacea-for-indias-food-security/>, July 22, 2022.

**OPINION – Ramesh Thakur**

**How Much Damage have Putin's Threats Done to the Nuclear Non-Proliferation Regime?**

Russia's invasion of Ukraine, it's fair to say, has already profoundly shaped the global discourse on nuclear weapons. In the deliberations at the inaugural meeting of the states parties of the Treaty on the Prohibition of Nuclear Weapons in Vienna last month, the Ukraine war cast a long

shadow over the utility and limits of nuclear weapons as a deterrent and as a tool of coercive diplomacy, the wisdom of having given them up, the incentives to either acquire them or shelter under another country's nuclear umbrella and, above all, the cataclysmic risks of an all-out nuclear war that no one wants but everyone dreads.

This, then, is the first and in some ways the most important lesson. The

existence of 11,405 nuclear weapons in the Russian and US arsenals (90% of world totals), far from helping to stabilise the crisis and calm the tensions, has added to the dangers and threats of the Ukraine war.

At an event in Vienna the day after the conference finished, on a panel he and I shared, the host and president of the conference, Alexander Kmentt, said with evident pride that the Vienna declaration (plus a 50-point action plan) adopted by the states parties was exceptionally strong for a multilaterally negotiated document. It was neither an activist text nor a bland statement of trite platitudes, but a declaration that demonstrated the seriousness of the new treaty.

Although some countries had wanted to censure Russia's actions in Ukraine, the Vienna declaration adopted a more neutral and even-handed tone. In paragraphs 4 and 5, participants expressed alarm and dismay at the 'threats to use nuclear weapons and increasingly strident nuclear rhetoric'. They condemned unequivocally 'any and all nuclear threats, whether they be explicit or implicit and irrespective of the circumstances', and also their use 'as instruments of policy, linked to coercion, intimidation and heightening of tensions' rather than to preserve peace and security.

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A popular pastime, going back to the Euromaidan revolution in 2014 and the annexation of Crimea, is to claim that the Russians wouldn't have dared to attack and dismember Ukraine if it hadn't given up its nuclear arsenal after the Soviet Union imploded. The claim doesn't withstand serious scrutiny. Like the US's nuclear-sharing arrangements with some NATO allies (and in the past, South Korea), the bombs weren't owned by the host, but by Russia, which retained exclusive operational control and launch authority.

Not one of the five permanent members of the UN Security Council, who are also the only five recognised nuclear-weapon states under the NPT, would have tolerated the emergence of another nuclear power with a stockpile of 1,900 strategic and 2,500 tactical nuclear weapons—several-fold more than Britain, China and France combined. Ukraine would have struggled to survive as an international pariah state and the whole history of the region would have been so different that the deterrence claim for the events of 2014 and 2022 is simply not a credible counterfactual.

Five months into the war, what I find most striking with respect to nuclear weapons is their near complete lack of utility. The presence of nearly 6,000 bombs in Russia's arsenal as a back-up for the biggest ground war in Europe since 1945, and none in Ukraine's, failed to intimidate Ukraine into surrendering. Kyiv has simply got on with the job of valiantly defending its territory confident that, having failed as a tool of coercive diplomacy, nuclear weapons are not militarily useable. Having already suffered severe damage from the illegal

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invasion, Russia's reputation would tank completely were it to use the bomb. Nor could Russia protect its own troops, the Russian-speaking enclaves of Ukraine and even parts of Russia proper from the radioactive fallout.

It's true that President Putin repeatedly reminded NATO of his formidable nuclear arsenal, publicly placed them on 'special alert' and warned of 'unpredictable consequences' if outsiders dared to intervene. None of that has stopped NATO from providing increasingly lethal and by all accounts very effective arms to Ukraine that have taken a deadly toll on Russia's military.

**Yet, the Ukraine crisis is likely to damage the already enfeebled efforts to promote nuclear arms control and disarmament. Russia has clearly broken its pledge under the 1994 Budapest memorandum to respect Ukraine's territorial integrity and borders in return for Ukraine giving up the nukes. This will not reassure the 184 non-nuclear weapon states about their security concerns.**

Of course, NATO has refrained from introducing its own ground troops or declaring and enforcing a no-fly zone over Ukraine. Yet it's debatable how much of this caution rests in consciousness of Russia's nuclear capability and how much arises from internalised memories of the failure of NATO military operations in Africa, the

Middle East and Asia since the end of the Cold War. These operations against minor regional opponents have mostly dramatically worsened the volatility, violence and regionwide instability. Who would want to own the chaos of the vast Russian landmass even if battlefield military victory was achieved? The catastrophic miscalculations of Napoleon and Hitler too, surely, play some role in injecting caution into rushing into a direct military fight with Russia, nukes or no nukes.

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up the nukes. This will not reassure the 184 non-nuclear weapon states about their security concerns. On the contrary, it might confirm North Korea in the strategic foresight of having gone down the nuclear path and encourage Iran to do the same. It has already reopened debates in some NATO and Pacific allies about joining in nuclear-sharing arrangements as an insurance policy, in the belief that the presence of US bombs on their territory, even if they remain in American hands and control, will create new facts on the ground and serve as tripwires against aggression.

And the fact that Finland and Sweden—the latter a major champion of nuclear disarmament and the former of a regional nuclear-weapon-free zone in the past—will become the latest to join NATO is yet more evidence that history does irony. For, as I have argued elsewhere, the alliance’s unbroken eastward expansion is a major explanation for Russia’s actions in Ukraine. NATO’s northward expansion into the Baltic in turn becomes a major consequence of Russia’s aggression against Ukraine.

*Source: <https://www.aspistrategist.org.au/how-much-damage-have-putins-threats-done-to-the-nuclear-non-proliferation-regime/>, July 18, 2022.*

**OPINION – James Stavridis**

**Putin won’t Use a Nuke, Chemical Weapons, May Be**

As a former military commander of the NATO, I do a lot of speaking in the US and internationally about the war in Ukraine. The question I get asked most frequently is terrifying and simple: “Would

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Remember that days after the invasion, Putin publicly put his forces on nuclear alert, a reminder to the West that Russia is a nuclear-capable nation

with a powerful arsenal of around 6,000 weapons. His ominous “reminders” have continued. The US, of course, is equally well supplied. Both nations have long-range, high-yield strategic weapons for

**First, although Putin may seem not to care about international opinion, any use of a nuclear weapons would have immense negative repercussions around the globe. The Russian leader is keenly aware that from an economic and diplomatic perspective, he must keep China (at least passively) on his side — for selling his oil and gas, controlling the UNSC and obtaining high-technology imports.**

delivery by a triad of systems — intercontinental ballistic missiles; long-range bombers and missile-carrying jets; and ballistic-missile submarines. Both also have stockpiles of “tactical” nuclear weapons — lower-yield warheads that could conceivably be used in limited measures on battlefields — including nuclear-tipped cruise missiles and gravity-drop

bombs carried by aircraft.

Beyond the US arsenal, NATO is a nuclear-capable alliance: French and British strategic forces reportedly number around 500 devices, deployable in a variety of ways. These forces are both national weapons and under the authority of the alliance, with the supreme allied commander having verification codes. In other words, there are lots of nukes on either side of the Ukraine conflict. But there are three important factors holding Putin back from using his, through either strategic or tactical use.

First, although Putin may seem not to care about international opinion, any use of a nuclear weapons would have immense negative

repercussions around the globe. The Russian leader is keenly aware that from an economic and diplomatic perspective, he must keep China (at least passively) on his side — for selling his oil and gas, controlling the UNSC and obtaining high-technology imports.

He also wants to maintain additional economic strength, especially sales of his hydrocarbons in the “swing vote” regions of Latin America, sub-Saharan Africa and South Asia (especially India). Using a nuclear weapon would lose him support from many of the nations that are trying to steer a narrow course between the Western-backed Ukrainians and Russia.

A second concern is that using a nuke would make control of the ladder of escalation difficult and dangerous. Putin knows that once the threshold is crossed, even by a tactical weapon, the Western nuclear nations would go on high alert and the possibility of miscalculation leading to a major strategic exchange rises. Putin likes his life and loves his country — he’d not be enthusiastic about risking it all, even for the prize of Ukraine. (I co-authored a novel about a war between the US and China in the year 2034 that follows such a scenario, and it’s all-too possible.)

Third, could Putin use a *tactical* nuclear weapon against a specific target in Ukraine? Potentially Kyiv (to decapitate the government) or the western city of Lviv (to destroy the supply chain providing arms through Poland) or the Black Sea port of Odesa (killing the Ukrainian economy)? Conceivable, but unlikely. Putin could achieve many of those military goals by using conventional means, if he massed his offensive fires at a given city. He would probably calculate that the risks of a tactical strike outweigh the benefits. In the end, it’s more likely that if Putin wants to

do something to really strike terror into Ukrainian hearts, he would opt for a chemical weapon, perhaps directing it against one of those three city targets. He has shown in Syria an indifference to the use of chemical weapons by his ally, President Bashar al-Assad.

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And, importantly, it would be more difficult for the West to conclusively attribute the use of a chemical weapon to Putin—the delivery is more ambiguous, and he’s already laid the disinformation groundwork to point to US-Ukrainian

chemical and biological programs (fiction, but embedded in many social networks). Worrying about Putin’s using a weapon of mass destruction is warranted — but more likely it would be chemical than nuclear. Cold comfort perhaps, but at least we would remain at arm’s length from the lever to the apocalypse.

Source: <https://www.bloomberg.com/opinion/articles/2022-07-20/ukraine-russia-war-why-putin-won-t-use-a-nuclear-weapon>, July 20, 2022.

**OPINION – Oscar Arias, Jonathan Granoff**

**Nuclear Strategy and Ending the War in Ukraine**

It is time for bolder efforts to make peace in Ukraine. War, like fire, can spread out of control, and as President Putin keeps reminding us, this particular conflagration has the potential to start a nuclear war. At a recent joint news conference with the President of B e l a r u s , Putin announced that Russia would transfer Iskander M missiles to Belarus. Those missiles can carry nuclear warheads, and the move is apparently intended to mirror nuclear sharing arrangements the US has with five NATO allies — Belgium, the Netherlands, Germany, Italy, and Turkey.

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U.S. nuclear weapons were introduced into Europe in the 1950s as a stopgap measure to defend NATO democracies whose conventional forces were weak. The number of nuclear weapons in those five countries peaked around 7,300 warheads in the 1960s, then dwindled to about 150 today, reflecting NATO's growing conventional strength and its diminishing estimation of the military usefulness of nuclear weapons. But even 150 nuclear weapons could be more than sufficient to touch off a dangerous confrontation with Russia. The world is as close to the nuclear abyss today as it was during the Cuban Missile Crisis. In fact, contemporary nuclear risks may actually be worse. Whereas Cuban Missile Crisis lasted just 13 days, the fighting in Ukraine will likely continue and tempt fate for many months to come.

Negotiations are therefore essential to defuse nuclear tensions. Even though it has no direct role in the Ukraine war, it's appropriate for NATO to have a role in encouraging negotiations to end it. Since NATO is an enormously strong military force — stronger even than Putin's Russia — and since President Putin has said that the war in Ukraine is in part a response to NATO's actions, NATO calling for peace negotiations would be fitting and carry some weight.

It would also be in keeping with NATO member states' obligations under the NPT. NATO leaders meeting in Madrid recently reaffirmed that "The NPT is the essential bulwark against the spread of nuclear weapons and we remain strongly

committed to its full implementation, including Article VI [the article that commits nuclear-armed states to pursuing nuclear disarmament]." This commitment includes, according to the Non-Proliferation Treaty's 2000 Review Conference report, "a diminishing role for nuclear weapons in security policies to minimize the risk that these weapons ever be used and to facilitate the process of their total elimination." NATO traditionally maintains strong deterrence and defense, while it has also

led the way toward detente and dialogue. NATO's current commitment to deterrence and defense is clear. But to restart conversations, NATO must now also find a way to encourage détente and dialogue.

Bringing both sides back into dialogue will require a dramatic gesture. Therefore, we propose NATO plan and prepare for withdrawal of all U.S. nuclear warheads from Europe and Turkey, preliminary to negotiations. Withdrawal would be carried out once peace terms are agreed between Ukraine and Russia. Such a proposal would get Putin's attention and might bring him to the negotiating table.

Removing U.S. nuclear weapons from Europe and Turkey would not weaken NATO militarily, since nuclear weapons have little or no actual usefulness on the battlefield. If they are truly weapons of last resort, there is no need to deploy them so close to Russia's border. Under this proposal, France, the United Kingdom, and the US would retain their national nuclear arsenals, and if the worst happened, they could still use them on NATO's behalf.

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Despite 70 years without a major war, it is not possible for nuclear deterrence to last forever. It only works as long as human beings make the right choices. Yet we know humans are flawed, and we all make mistakes. Therefore, we concur with UN Secretary General Guterres, who said, "These weapons offer false promises of security and deterrence — while guaranteeing only destruction, death, and endless brinksmanship," and with Pope Francis, who said, "[Nuclear weapons] exist in the service of a mentality of fear that affects not only the parties in conflict, but the entire human race.," as well as with the late U.S. Senator Alan Cranston who simply said, "Nuclear weapons are unworthy of civilization." NATO's nuclear arsenal failed to deter Russia's invasion of Ukraine and has almost no utility as a weapon of war. But NATO's nuclear weapons can still be put to good use, not by threatening to launch them and escalate the war, but by withdrawing them to make room for new negotiations and eventual peace.

Source: <https://thehill.com/opinion/international/3565996-nuclear-strategy-and-ending-the-war-in-ukraine/>, July 19, 2022.

**OPINION – Shivjeet Parthasarathy, Armin Rosencranz, Govind Singh**

### **Nuclear Energy Offers the Best Bang for the Buck**

Our knowledge of nuclear energy is clouded. The specters of Fukushima and Chernobyl, visions of a mushroom cloud, and desolate fallout loom large over our heads. Mass media has kept our attention divided by focusing more on the challenges and threats of nuclear energy. This does not allow us to weigh the pros and cons of nuclear energy in a fair manner. It is no wonder

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then that we have failed to appreciate the benefits of nuclear energy which greatly outweigh the relative threats. The environmental and economic advantages of adopting nuclear energy are many, including overcoming the climate emergency. Nuclear power has been touted as an expensive form of energy. However, nuclear energy provides greater bang for the buck than all existing energy sources, including renewable energy.

While the capital cost of establishing nuclear power plants may seem high, the combined capital and operation and management costs make nuclear energy the most economic option. The technology and framework required for harnessing nuclear energy is available unlike in the case of renewable energy. Research is being undertaken for developing next-generation nuclear plants that will soon reduce the large up-front cost of nuclear energy. According to the US EIA, energy-related carbon dioxide emissions will continue to increase through 2050 in a business-as-usual scenario. The US EIA projects that renewables may become the primary source for new electricity generation in the coming decades. However, it warns that fossil fuels along with batteries will continue to be used to meet rising energy demand and provide grid reliability.

In developing economics especially in the Asian region, oil and natural gas production is projected to increase in the coming decades. If alternatives to fossil fuels are not made available immediately, the transition to a green economy will remain a distant dream. Nuclear energy is a source of clean, reliable, and affordable energy and is a major alternative. There are currently over 400 nuclear reactors for generating electricity located in over 30 countries worldwide. Twenty per cent of generated electricity in the US is based on nuclear power. France has the highest percentage of nuclear energy dependence amounting to over 71 per cent. Other European nations like Hungary, Belgium and



Sweden are also drawing the benefit of nuclear energy over several decades. Around 10 per cent of the world's electricity is based on nuclear energy which is a time-tested alternative to fossil fuels.

The contribution of nuclear energy to combating climate change has, however, remained elusive and needs to be mainstreamed. The IAEA estimates that between 1971 and 2018, nuclear power avoided the emissions of 74 gigatons of carbon dioxide, a potent greenhouse gas which contributes to global warming. This is equivalent to cumulative emissions from the entire power sector for six years from 2013 to 2018. In the report titled, *Climate Change and Nuclear Power 2020*, the IAEA Director General R.M. Grossi observed that nuclear energy is reducing carbon dioxide emissions equivalent to taking 400 million cars off the road every year. We are at a stage in our civilization where deep decarbonization, at any cost, is the need of the hour. Nuclear energy has already been playing its part in a cost-effective manner.

The levelized cost of electricity (LCOE) generation varies in different countries according to policies and resource availability. The LCOE can be divided into capital cost of constructing power plants and their operation & maintenance costs. According to the International Energy Agency, the capital costs of coal power plants is much less than that of nuclear power plants and renewables. However, coal power plants have such high operation and maintenance costs that their overall LCOE, based on assumptions of the IEA, is much higher than that of nuclear energy or renewable energy.

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Further, the capital costs of nuclear power plants are comparable with renewables like solar. This is due to the declining costs of photovoltaic cells. However, considerable research and innovation is required for greater integration and adoption of solar energy. Unfortunately, we have run out of time and need to urgently shift away from fossil fuel-based electricity generation.

Nuclear energy has been providing low carbon-based electricity for several decades. It can play an important role today in clean energy transition and its contribution to climate change mitigation must be recognized. Nuclear energy can easily replace fossil fuels and the only limiting factor, nuclear waste, is relatively easily manageable as compared to emissions from fossil fuels. In the long run, when renewable energy related technologies improve, nuclear energy-based electricity generation can help limit temporal fluctuations in output from renewables like wind and solar and provide grid stability. All these attributes make nuclear energy an excellent investment option for meeting the clean energy needs of today and tomorrow.

Source: <https://www.thestatesman.com/opinion/nuclear-energy-offers-best-bang-buck-1503089822.html>, July 14, 2022.

**OPINION – Alicia Sander-Zakre, Ruth Rohde**

**Vienna Declaration: A Progressive Path for Nuclear Disarmament**

The Treaty on the Prohibition of Nuclear Weapons (TPNW) is already making waves at its first Meeting of States Parties. Adopted in

2017, the TPNW entered into force in 2021 and has thus far attracted sixty-five state parties and eighty-six signatories. Beyond being the first international treaty banning nuclear weapons, the TPNW also has positive obligations to assist victims of nuclear weapons use and testing and remediate contaminated environments. The treaty sets a powerful norm for nuclear disarmament based on principles of humanity and equality between states—founded on nuclear weapons abolition.

In June, states and civil society met in Vienna for the first Meeting of States Parties. States parties unanimously adopted the Vienna Declaration, a clear and decisive condemnation of nuclear weapons, and a pledge to work towards their elimination. States also adopted the treaty's first Action Plan—a roadmap for states parties to advance toward nuclear disarmament and implementation of the treaty.

The Vienna Action Plan is significant not only as the only plan to be adopted on nuclear weapons in more than a decade but also because it advances bold and progressive principles for the nuclear weapons field and disarmament law more broadly. As highlighted by state parties in the Action Plan, the TPNW “builds upon, contributes to, and complements a rich and diverse disarmament and non-proliferation architecture.” An analysis of the most recent action plans from the Mine Ban Treaty, Cluster Munitions Convention, and NPT shows how the Vienna Action Plan breaks

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**The emphasis on the inclusion of civil society, communities affected by nuclear weapons use and testing, and Indigenous peoples in the work and meetings of the treaty is one of the key advancements of the Vienna Action Plan. Specific action items are dedicated to inclusion within the context of the implementation of the treaty articles. In a significant step forward, the action plan also addresses inclusion as a general principle to be applied in all treaty implementations.**

new ground with strong and innovative commitments to the inclusion of civil society, affected communities, and Indigenous peoples; gender and disarmament; universalization; victim assistance, environmental remediation, and international cooperation; scientific advice, and disarmament verification.

**Inclusion:** The emphasis on the inclusion of civil society, communities affected by nuclear weapons use and testing, and Indigenous peoples in the work and meetings of the treaty is one of the key advancements of the Vienna Action Plan. Specific action items are dedicated to inclusion within the context of the implementation of the treaty articles. In a significant step forward, the action plan also addresses inclusion as a general principle to be applied in all treaty implementations.

Concerning universalization of the TPNW, Action 13 commits states to “encourage and support involvement and active cooperation of all relevant partners,” including “the UN and the UN Secretary-General, including UN regional centres for peace and disarmament, other international institutions and organizations, the International Committee of the Red Cross (ICRC), the ICAN and other non-governmental organizations as well as parliamentarians and interested citizens.”

On victim assistance and environmental remediation, Actions 19 and 27 articulate clear commitments to inclusion. States parties commit in Action 19 to “engage with relevant

stakeholders, including international organizations, civil society, affected communities, indigenous peoples, and youth, and work cooperatively to advance effective and sustainable implementation of Articles 6 and 7." In particular, they will "closely consult with, actively involve, and disseminate information to, affected communities at all stages of the victim assistance and environmental remediation process." In Action 27, they commit to "draw on the input of relevant stakeholders, including international organizations, civil society, affected communities, indigenous peoples, and youth" to develop guidelines for voluntary reporting on the implementation of these articles.

The unusual attention to inclusion in the Vienna Action Plan is most apparent in the section dedicated to "Principles of inclusivity and cooperation among stakeholders in the implementation of the Treaty." These actions commit states not just to closely cooperate with the ICRC, ICAN, academia, affected communities, and other civil society organizations and integrate gender considerations, but also to facilitate their active participation, taking into account the different needs of people in communities affected by nuclear weapons and of indigenous peoples, including by contributing (on a voluntary basis) to facilitate their representation at treaty meetings. These commitments are further enshrined in the decision of the Meeting of States Parties to include ICAN and the ICRC as observers in the Coordination Committee to oversee the intersessional working groups taking forward the action plan's commitments.

**Gender and Disarmament:** The Vienna Action Plan is also revolutionary for the nuclear weapons field in putting states' verbal

commitments to a progressive approach to gender into concrete actions. Like with inclusion, this is integrated into actions on the implementation of specific articles of the treaty and also addressed as its own category, to be applied in the implementation of the treaty as a whole.

Action 25 recalls the treaty's requirement to conduct victim assistance in a "gender-sensitive" manner, "given the disproportionate impact of nuclear weapons use and testing on women and girls and indigenous people." In establishing a network of scientific and

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As with inclusion, it is the section dedicated to "Implementing the Gender Provisions of the TPNW," Actions 47-50, which marks a particularly critical advancement from previous disarmament

treaty action plans. States committed through the Vienna Action Plan to operationalize their gender commitments at the national level, including by establishing a state as a Gender Focal Point (Chile) to support implementation and report on progress, recommending "that gender considerations are taken into account across all TPNW national policies, programs and projects," and working on guidelines in the intersessional period on age and gender-sensitive victim assistance and the integration of gender perspectives in international cooperation and assistance.

**Universalization:** More than any other recent humanitarian disarmament treaty action plan, the Vienna Action Plan makes getting more states to join it a priority, with fourteen actions

dedicated to states parties' work to implement Article 12 to universalize the treaty. Universalization steps include how states can engage in promoting the values of the treaty through direct diplomatic engagements, as well as ways to share knowledge about the practical steps of ratification and identifying gaps in information to facilitate accession.

While some critics of the treaty have argued that countries with active civil societies will be more likely to join it in response to pressure from their populations, the clear commitment from states to encourage all states, regardless of governance structure, in international and bilateral meetings to join the treaty underscores the universal pressure of international law.

***Victim Assistance and Environmental Remediation:***

The humanitarian impacts of nuclear weapons use and testing have been a driving force behind the creation of the TPNW. The Vienna Action Plan sets out the first framework of solidarity for states to provide victim assistance and environmental remediation to address nuclear harm, building on the precedent of other humanitarian disarmament treaties.

This approach is unique in the nuclear disarmament architecture. While the 2010 NPT Review Conference Final Document encouraged "all Governments and international organizations that have expertise in the field of clean-up and disposal of radioactive contaminants to consider giving appropriate assistance as may be requested for

remedial purposes in these affected areas," neither the NPT nor the 2010 NPT Action Plan committed states to actionable steps to provide this assistance.

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The Vienna Action Plan reinforces and adds to the requirements written into the treaty's Articles 6 and 7. It articulates that implementation must be based on "principles of accessibility, inclusivity, non-discrimination, and transparency and in coordination with affected communities," and provided "in a manner

that is age- and gender-sensitive." All states agreed to establish a government representative (focal point) responsible for this work within three months and adopt any national laws to implement it, examine how to establish an international trust fund to fund this work, and consider a reporting format.

**The Vienna Action Plan introduced a new structure for nuclear disarmament, drawing on precedents from the Biological and Chemical Weapons Conventions and the CTBT: a scientific advisory group. Scientists have already made significant contributions to the treaty and its implementation, for example, by providing research to support states' determination of deadlines for nuclear weapons destruction when a nuclear-armed state joins or removal when a state hosting another's nuclear weapons joins.**

Crucially, states that consider themselves to have been affected by nuclear weapons use or testing will assess the needs of people affected and the contamination of the environment, as well as national assessments of capacities to address them, and complete initial assessments by the next Meeting of States Parties in 2023. They will also develop plans for implementing assistance and environmental remediation, including budgets and timeframes.

Other states parties in a position to do so are committed to providing "technical, material and financial assistance" to those states affected by nuclear use and testing.

**Scientific Advisory Group:** The Vienna Action Plan introduced a new structure for nuclear

disarmament, drawing on precedents from the Biological and Chemical Weapons Conventions and the CTBT: a scientific advisory group. Scientists have already made significant contributions to the treaty and its implementation, for example, by providing research to support states' determination of deadlines for nuclear weapons destruction when a nuclear-armed state joins or removal when a state hosting another's nuclear weapons joins.

Experts from "the broadest possible pool in the field of nuclear disarmament and non-proliferation," as well as the humanitarian consequences and risks associated with nuclear weapons and humanitarian responses, will comprise the scientific advisory group. In further acknowledgment of the treaty's commitment to inclusion and diversity, this includes the establishment of a "geographically diverse and gender balanced network of experts and institutions to support the goals of the TPNW" that are to be engaged by states parties by the next Meeting of States Parties.

The idea behind the group is that a comprehensive understanding of the humanitarian impacts of nuclear weapons, their risks, and technical guidance for eliminating nuclear weapons is crucial to implementing the treaty.

**Disarmament Verification:** One area in which scientific advice has been and will continue to be invaluable is implementing the treaty's provisions in Article 4 on verifying the

destruction and removal of nuclear weapons. The first Meeting of States Parties advanced a

timeline for disarmament by deciding on deadlines to eliminate nuclear weapons once a nuclear-armed state joins the treaty and to remove nuclear weapons should a country hosting another's nuclear weapons join. Actions 15-18 of the Vienna Action Plan commit states to further advance this plan through discussions in the intersessional period on international authority to verify compliance with dismantlement and the designation of national contact points within

ninety days on this subject. The treaty has already provoked fresh research on nuclear disarmament verification, including a new UN Institute for Disarmament Research report presented at the first Meeting of States Parties with expert contributions on implementing verification under the treaty.

**Looking Ahead:** The TPNW first Meeting of States Parties laid the groundwork for implementing the treaty and advancing toward total nuclear disarmament. The adoption of the Vienna Action Plan signals, like no other disarmament treaty action plan, the serious commitment of state parties not just to the ultimate goal of humanitarian nuclear disarmament but also to the inclusion of civil society and Indigenous peoples, gender equality, and more.

States parties have set themselves concrete, achievable goals. They have come up with a work structure in the time before the next

**The first Meeting of States Parties advanced a timeline for disarmament by deciding on deadlines to eliminate nuclear weapons once a nuclear-armed state joins the treaty and to remove nuclear weapons should a country hosting another's nuclear weapons join. Actions 15-18 of the Vienna Action Plan commit states to further advance this plan through discussions in the intersessional period on international authority to verify compliance with dismantlement and the designation of national contact points within ninety days on this subject.**

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Meeting of States Parties, already scheduled for November 27-December 1, 2023, under the presidency of Mexico's Juan Ramón de la Fuente. Informal working groups will meet regularly to move the ball forward on universalization, victim assistance, environmental remediation (led by Kazakhstan and Kiribati), international cooperation and assistance, as well as the implementation of steps toward the total elimination of nuclear weapons, including the designation of competent international authority to verify elimination. Ireland, acting as an informal coordinator, will explore areas of cooperation between the TPNW and the NPT and all state parties will emphasize the complementarity between the TPNW and the entire existing disarmament and non-proliferation regime.

As states gather in New York in August for the 10th NPT Review Conference, they can look to the success of the first Meeting of States Parties of the TPNW as a model for cooperative and productive work. This Action Plan is only the beginning. It is a "to-do list" for all states committed to achieving nuclear disarmament. All states serious about getting rid of weapons of mass destruction should join the Treaty on the Prohibition of Nuclear Weapons and take part in its framework of collective action to make it happen.

Source: <https://nationalinterest.org/blog/buzz/vienna-declaration-progressive-path-nuclear-disarmament-203703?page=0%2C1>, July 21, 2022.

## **NUCLEAR STRATEGY**

### **NORTH KOREA**

#### **Kim Threatens to Use Nukes Amid Tensions with US, S. Korea**

North Korean leader Kim Jong Un warned he's ready to use his nuclear weapons in potential

military conflicts with the United States and South Korea, state media said on 28 July, as he unleashed fiery rhetoric against rivals he says are pushing the Korean Peninsula to the brink of war.

Kim's speech to war veterans on the 69th anniversary of the end of the 1950-53 Korean War was apparently meant to boost internal unity in the impoverished country amid pandemic-related economic difficulties. While Kim has increasingly threatened his rivals with nuclear weapons, it's unlikely that he would use them first against the superior militaries of the U.S. and its allies, observers say.

... He accused the United States of "demonizing" North Korea to justify its hostile policies. Kim said regular U.S.-South Korea

military drills that he claimed target the North highlight U.S. "double standards" and "gangster-like" aspects because it brands North Korea's routine military activities — an apparent reference to its missile tests — as provocations or threats.

Kim also alleged the new South Korean government of President Yoon Suk Yeol is led by "confrontation maniacs" and "gangsters" who have gone further than previous South Korean conservative governments. Since taking office in May, the Yoon government has moved to strengthen Seoul's military alliance with the United States and bolster its own capacity to neutralize North Korean nuclear threats including a preemptive strike capability.

"Talking about military action against our nation, which possesses absolute weapons that they fear the most, is preposterous and is very dangerous suicidal action," Kim said. "Such a dangerous attempt will be immediately punished by our powerful strength and the Yoon Suk Yeol government and his military will be annihilated."

... In a statement read by spokesperson Kang In-sun, Yoon's presidential national security office said South Korea will safeguard its national security and citizens' safety based on a solid alliance with the United States. It urged North

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Korea to return to talks to take steps toward denuclearization. Earlier, South Korea's Defense Ministry repeated its earlier position that it's been boosting its military capacity and joint defense posture with the United States to cope with escalating North Korean nuclear threats. ...

Source: Hyung-Jin Kim, <https://apnews.com/article/covid-health-seoul-south-korea-nuclear-weapons-e285be60ef404092fe3324748fa60707>, July 29, 2022.

## **BALLISTIC MISSILE DEFENCE**

### **USA-NETHERLANDS**

#### **State Department Oks \$1.2bn Patriot MIM-104E GEM-T Ballistic Missile Sale to Netherlands**

The State Department has approved the Dutch government's request to buy from the U.S. government Patriot MIM-104E Guidance Enhanced Missile-Tactical ballistic missiles through a potential \$1.22 billion foreign military sales agreement. Raytheon Technologies (NYSE: RTX) will serve as the prime contractor in the proposed transaction that covers tools and test equipment, spare and repair parts, range and test programs, training equipment, associated publications and technical documentation, the Defense Security Cooperation Agency said.

The Netherlands also requested U.S. government and contractor technical assistance, engineering, systems integration and checkout, International Engineering Services Program Field Surveillance Program, field office support, logistics and program support services. The proposed FMS deal will enable the European country to meet existing and future threats, improve the defensive capabilities of its military and enhance interoperability with U.S. and NATO forces. DSCA said it notified Congress

of the potential transaction 21 July.

Source: <https://www.govconwire.com/2022/07/state-dept-oks-1-2b-patriot-mim-104e-gem-t-missile-sale-to-netherlands/>, July 22, 2022.

## **EMERGING TECHNOLOGIES AND DETERRENCE**

### **USA**

#### **TAE Technologies Secures Funds to Build Next Fusion Machine**

TAE's approach to fusion combines advanced accelerator and plasma physics, and uses abundant, non-radioactive hydrogen-boron (p-B11) as a fuel source. The proprietary magnetic beam-driven field-reversed configuration (FRC) technology injects high-energy hydrogen atoms into the plasma to make the system more stable and better confined. This solution is compact and energy efficient, California, USA-based TAE says.

Norman - TAE's USD150 million National

Laboratory-scale device named after company founder, the late Norman Rostoker - was unveiled in May 2017 and reached first plasma in June of that year. It was designed to keep plasma stable at 30 million degrees Celsius. In April 2021, TAE

announced that Norman had produced stable plasma at over 50 million degrees Celsius. The machine has now proven capable of sustaining stable plasma at more than 75 million degrees Celsius, 250% higher than its original goal. TAE said

the milestone furthers confidence in its path to commercialisation, and has aided the company in raising USD250 million in additional funding from investors in the energy, technology and engineering sectors. When combined with prior rounds, TAE has now raised over USD1.2 billion from investors.

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The strategic and institutional investments, it said, will fund the construction of its sixth-generation research reactor. TAE's Copernicus reactor, which will be constructed in Irvine, California, will operate well in excess of 100 million degrees Celsius to simulate net energy production from the conventional Deuterium-Tritium (D-T) fuel cycle. Copernicus will provide opportunities for TAE to licence its technology for D-T fusion, while scaling to its ultimate goal utilising p-B11.

TAE said Chevron, Google, Reimagined Ventures, Sumitomo Corporation of Americas (SCOA) and TIFF Investment Management are among the company's most recent investors, along with "a large US West coast based mutual fund manager and a big US pension fund". ...SCOA, the largest subsidiary of Tokyo-based Sumitomo Corporation, becomes TAE's first investor from Japan, and will become a partner in deploying commercial power and other fusion-derived technologies to the Asia-Pacific market. SCOA has signed a commercial collaboration agreement to pursue TAE-based technologies in Japan and Asia. "...

Source: <https://www.world-nuclear-news.org/Articles/TAE-Technologies-secures-funds-to-build-next-fusio>. July 20, 2022.

### **FBI Investigations Determined Chinese-Made Huawei Equipment could Disrupt US Nuclear Arsenal Communications**

On paper, it looked like a fantastic deal. In 2017, the Chinese government was/ offering to spend \$100 million to build/ an ornate Chinese garden

at the National Arboretum in Washington DC. Complete with temples, pavilions and a 70-foot white pagoda, the project thrilled local officials, who hoped it would attract thousands of tourists every year.

But when US counterintelligence officials began digging into the details, they found numerous red flags. The pagoda, they noted, would have been strategically placed on one of the highest points in Washington DC, just two miles from the US Capitol, a perfect spot for signals intelligence collection, multiple sources familiar with the episode told CNN./ Also alarming was that Chinese officials wanted to build the pagoda with materials shipped to the US in diplomatic pouches, which US Customs officials are barred from examining, the sources said.

Federal officials quietly/ killed/ the project before construction was underway./ The canceled garden is part of a frenzy of counterintelligence activity/ by the FBI and other federal agencies/ focused on what career US security officials say has been a dramatic escalation of Chinese espionage on US soil over the past decade./ Since at least 2017, federal officials have investigated Chinese land purchases near critical infrastructure, shut down a high-profile regional consulate believed by the US government to be a hotbed of Chinese spies and stonewalled what they saw as clear efforts to plant listening devices near sensitive military and government facilities.

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**Among the most alarming things the FBI uncovered pertains to Chinese-made Huawei/ equipment atop cell towers near US military bases in the/ rural Midwest. According to multiple sources familiar with the matter, the FBI determined the equipment was capable of capturing and disrupting highly restricted Defense Department communications, including those used by US Strategic Command, which oversees the country's nuclear weapons.**



atop cell towers near US military bases in the rural Midwest. According to multiple sources familiar with the matter, the FBI determined the equipment was capable of capturing and disrupting highly restricted Defense Department communications, including those used by US Strategic Command, which oversees the country's nuclear weapons. While broad concerns about Huawei equipment near US military installations have been well known, the existence of this investigation and its findings have never been reported. Its origins stretch back to at least the Obama administration. It was described to CNN by more than a dozen sources, including current and former national security officials, all of whom spoke on condition of anonymity because they were not authorized to speak publicly. / It's unclear if the intelligence community determined whether any data was actually intercepted and sent back to Beijing from these towers. Sources familiar with the issue say that from a technical standpoint, it's incredibly difficult to prove a given package of data was stolen and sent overseas. /

The Chinese government strongly denies any efforts to spy on the US. Huawei in a statement to CNN also denied that its equipment is capable of operating in any communications spectrum allocated to the Defense Department. / But multiple sources familiar with the investigation tell CNN that there's no question the Huawei equipment/ has the ability to intercept not only commercial cell traffic but also the/ highly restricted airwaves used by/ the military and disrupt critical US Strategic Command communications, giving the Chinese government a potential window into America's nuclear arsenal.

**Turning Doves into Hawks:** Former officials/ described the probe's findings as a watershed moment. The investigation was so/ secret/ that some senior policymakers in the White House and

elsewhere in government weren't briefed on its existence until 2019, according to two sources familiar with the matter. That fall, the Federal Communications Commission initiated a rule that effectively banned small telecoms from using Huawei and a few other brands of Chinese made-equipment. / "The existence of the investigation at the highest levels turned/ some/ doves into hawks," said one former US official. /

**Critics See Xenophobic Overreach:** Despite its tough talk, the US government's refusal to provide evidence to back up its claims that Huawei tech poses a risk to US national security has led some critics to accuse it of xenophobic overreach. The lack of a smoking gun also raises questions of whether US officials can separate legitimate Chinese investment from espionage. / "All of our products imported to the US have been tested and

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certified by the FCC before being deployed there," Huawei said in its statement to CNN. "Our equipment only operates on the spectrum allocated by the FCC for commercial use. This means it cannot access any spectrum allocated to the DOD." / "For more than 30 years, Huawei has maintained a proven track record in cyber security and we have never been involved in any malicious cyber security incidents," the statement said....

Source: <https://edition.cnn.com/2022/07/23/politics/fbi-investigation-huawei-china-defense-department-communications-nuclear/index.html>. July 23, 2022.

### **Hypersonic Missile Defense Requires Advanced Solutions**

Hypersonic weapons pose a major new threat to US' national security around the world. Hypersonic missiles can move at five times the speed of sound and maneuver in flight, and they are emerging from adversarial nations. U.S. officials

recently acknowledged Russia's use of hypersonics in its invasion of Ukraine, and China's hypersonics capabilities are top of mind for allied forces operating in the Pacific. Defending against the fast and agile missiles, known as counter-hypersonics, requires an improved and layered defense architecture that includes advanced sensors in space, missile interceptors, directed energy weapons and non-kinetic methods.

The Department of Defense is working on next-generation interceptors, which aim to strike and eliminate hypersonic missiles where they are most vulnerable — in their midcourse or glide phase.

For example, DARPA's Glide Breaker could come online in 2026, while the MDA is developing the Glide Phase Interceptor with a 2027-to-2028 timeline. They are part of a host of programs to evolve and upgrade the U.S. missile defense system and the DOD's sensing, tracking and engagement architecture currently designed for ballistic missiles.

While the hypersonic interceptor programs are running in parallel, concurrent inter-agency projects to build an improved missile warning and tracking sensor layer are underway. The U.S. Space Force's Space Systems Command, with MDA and the Space Development Agency (SDA), is overseeing the next-generation overhead persistent infrared (Next Gen OPIR) program to develop resilient constellations of sensor satellites to detect, track and disseminate timely data on missile launches.

**Providing Support to Answer Important Hypersonics Questions:** SAIC is supporting Space Systems Command and the Next Gen OPIR at Los Angeles Air Force Base in El Segundo, Calif. and at Eglin Air Force Base in the Florida Panhandle in the analysis and integration of the payloads for the satellites. SAIC is also working with MDA on

contributions to counter-hypersonics. Traditional defense against ballistic weapons has focused on defeating missiles while they are in their midcourse phase or terminal phase when they glide and descend to their targets. Hypersonic missiles present far higher complexity for glide- and terminal-phase defense because of their extreme speeds and ability to maneuver. While MDA is addressing boost-phase and glide-phase capabilities, we focus our counter-hypersonics support for the agency with modeling and simulation of operational scenarios involving missile defeat as well as "left-of-launch" techniques.

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Left-of-launch methods look to preemptively disrupt or destroy our adversaries' hypersonic capabilities while missiles are still on the ground, since a long chain of infrastructure assets exists to send off a hypersonic weapon. We must also address alternative, non-kinetic kill mechanisms that hit at the source through cyber and electronic means to obviate the costs and risks of missile engagement.

...The analysis covered possible outcomes of scenarios involving different defense strategies and thousands of variables. MDA disseminated SAIC's report to the Secretary of Defense and Congress, but the legislative and executive branches of the government will often turn to us directly for modeling and simulation support when they need to see the broad implications of emergent and urgent operational needs. Fortunately, not all of our "what-if" studies take a year or longer.

**JADC2 could be Key to Left-of-Launch Counter-Hypersonics:** Left-of-launch missile defeat opportunities could open up further as the DOD overlays its joint all-domain command-and-control (JADC2) strategy on top of the hypersonic defense architecture. JADC2 initiatives to interconnect the

right sensor to the right shooter with the right communication anywhere across air, land, sea, space and cyber domains would accelerate coordinated and decisive actions to deny adversaries the ability to strike with hypersonic weapons.

In end-to-end counter-hypersonics, JADC2 “can solve the left-through-launch piece,” said Running. Our team of analysts, modeling and simulation engineers, mathematicians and data scientists leverage tools in SAIC’s digital engineering suite to rapidly visualize and test systems architectures and decision models, weighing their pros and cons. The digital engineering ecosystem runs on our high performance computing (HPC) resources on site and in our secure cloud that can expand to tens of thousands of CPUs for processing power.

We use artificial intelligence and machine learning algorithms to bolster the mathematical techniques and run millions or billions of samples in helping customers understand how each architectural or strategic decision might gain one benefit and lose another, affect program risk and requirements, and influence the decision-making chain of events. ...Whether it is from a long-term study or a quick-turn exercise, decision-makers walk out of SAIC’s hypersonics analyses informed of strengths, disadvantages and opportunities, knowing how their hypersonic defense architectural decisions can impact outcomes and mission effectiveness.

Source: <https://www.asdnews.com/news/defense/2022/07/20/hypersonic-missile-defense->

*requires-advanced-solutions, July 20, 2022.*

### US Developing Satellite System to Track Hypersonic Weapons

**Left-of-launch missile defeat opportunities could open up further as the DOD overlays its joint all-domain command-and-control (JADC2) strategy on top of the hypersonic defense architecture. JADC2 initiatives to interconnect the right sensor to the right shooter with the right communication anywhere across air, land, sea, space and cyber domains would accelerate coordinated and decisive actions to deny adversaries the ability to strike with hypersonic weapons.**

The U.S. will spend \$1.3 billion to develop advanced satellites that will be able to better track hypersonic missile threats, the Pentagon said, announcing two new contracts that will put the detection and tracking systems in orbit by 2025. ... [T]he contracts will provide 28 satellites, as the U.S. moves to greatly expand and enhance its ability to counter increasing threats from Russia and China. Both countries have

been making strides in their development of hypersonic missiles, which are more difficult to track and shoot down because they maneuver more in flight than conventional weapons that travel in predictable paths.

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Last year China tested what U.S. officials said was a hypersonic missile, and Russia has used the weapons in strikes during the war in Ukraine. “Russia and China have been developing and testing hypersonic glide vehicles — these advanced missiles

that are extremely maneuverable,” Tournear told Pentagon reporters. “These satellites are specifically designed to go after that next generation version of threats out there so that we can detect and track these hypersonic maneuvering vehicles and predict their impact point.”

Additional funding for the program was provided by Congress specifically in response to concerns in the Indo-Pacific region, in response to China’s rapidly progressing military development.

Hypersonic weapons are defined as anything traveling beyond Mach 5, or five times faster than the speed of sound. That's about 3,800 mph (6,100 kph). Intercontinental ballistic missiles far exceed that threshold but travel in a predictable path, making it possible to intercept them. Historically, Tournear said, the U.S. has not flown satellites that were designed to detect and go after such maneuverable hypersonic weapons. Currently, he said, "we have limited capability to do that tracking aspect." He added, however, that "clearly we don't have zero capability to do tracking."

The new satellites, he said, will enable the U.S. to detect the launch, follow the hypersonic missile as it changes course, calculate where it is heading and provide that data to forces who can launch interceptors. The contracts were awarded to teams led by L3Harris Technologies, Inc. of Melbourne, Fla., and Northrop Grumman Strategic Space Systems of Redondo Beach, Calif. L3Harris will produce 14 satellites at a cost of about \$700 million, and Northrop will produce 14 at a cost of about \$617 million. The total cost of the program, including the launches and ground control and support, will be about \$2.5 billion.

Tournear said the program represents a shift for the U.S. toward a larger, overlapping system of satellites. Rather than relying on larger, more expensive satellites that stay in orbit for 15 or more years, the U.S. will have a greater number of cheaper satellites that would be replaced about every five years. One set, he said, would be at a lower orbit of about 1,000 kilometers, and a second set would be at a medium orbit of about 10,000-20,000 kilometers, providing a more resilient presence. He said the first 28 satellites would likely be followed by a second group of about 54. ...

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**The US successfully tested two Lockheed Martin Corp hypersonic missiles recently, the Pentagon said, amid growing concerns Russia and China have had more success developing their own hypersonic weapons. The U.S. Air Force confirmed it successfully tested its Air-Launched Rapid Response Weapon or ARRW booster on 12 July off the California coast.**

Source: <https://apnews.com/article/russia-ukraine-china-government-and-politics-78903c58bc990f16d12a5e16475682b8>, July 19, 2022.

### US Successfully Tests Pair of Lockheed Hypersonic Missiles

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"This second successful test demonstrates ARRW's ability to reach and withstand operational hypersonic speeds, collect crucial data for use in further flight tests, and validate safe separation from the aircraft," Lockheed said in a statement. Air Force Brig. Gen. Heath Collins, program executive officer, Armament Directorate, said, "We have now completed our booster test series and are ready to move forward to all-up-round testing later this year." The "all-up-round" includes the booster and the warhead. Hypersonic weapons travel in the upper atmosphere at more than five times the speed of sound, or about 6,200 km (3,853 miles) per hour.

In a separate hypersonic weapon test, the Defense Advanced Research Projects Agency or DARPA confirmed it successfully performed the first test

of its Operational Fires hypersonic weapon. The test was conducted at White Sands Missile Range in New Mexico. The successful tests show progress among the myriad U.S. hypersonic weapons development efforts, which have in cases been beleaguered by failed tests, growing questions about cost and increasing concerns the US is falling behind in what has become a superpower arms race.

Operational Fires is a ground-launched system that will “rapidly and precisely engage critical, time-sensitive targets while penetrating modern enemy air defenses.” DARPA has requested and received \$45 million for OpFires in fiscal year 2022. One of Lockheed Martin’s concepts for the DARPA weapon is to use an exiting High Mobility Artillery Rocket System launcher, like those sent to Ukraine, to launch the weapon. These successful tests come after a failed June 29 test flight of a different type of hypersonic weapon, the Common Hypersonic Glide Body, at the Pacific Missile Range Facility in Hawaii. ...

Source: [https://www.mvariety.com/news/us-successfully-tests-pair-of-lockheed-hypersonic-missiles/article\\_4c642862-0350-11ed-8b6d-f375bec8e711.html](https://www.mvariety.com/news/us-successfully-tests-pair-of-lockheed-hypersonic-missiles/article_4c642862-0350-11ed-8b6d-f375bec8e711.html), July 15, 2022.

**NUCLEAR COOPERATION**

**AFRICA–RUSSIA–CHINA**

**Russia and China Throw Weight Behind Africa’s Nuclear Power Drive**

African countries turning to nuclear power as electricity demand soars are finding partners in Russia and China, offering them an avenue to expand their influence in this fast-growing region.

**African countries turning to nuclear power as electricity demand soars are finding partners in Russia and China, offering them an avenue to expand their influence in this fast-growing region. Egypt broke ground on the country’s first nuclear power plant at El-Dabaa, 300 kilometers northwest of Cairo.**

**Rosatom signed cooperation agreements with Nigeria and Ghana in 2012, according to materials from the company. It has also reached cooperation agreements with Ethiopia, home to the second-largest population in Africa, and Zambia, which has rich metal reserves, as well as inking a memorandum of understanding with Morocco in 2017.**

Egypt broke ground on the country’s first nuclear power plant at El-Dabaa, 300 kilometers northwest of Cairo. Director General Alexey Likhachev, of Russia’s state-run Rosatom, which is building the facility, called this the “largest project of the Russian-Egyptian cooperation since the Aswan High Dam.”

The plant, slated to enter full operation by 2030, will consist of four pressurized-water reactors, believed to be top-of-the-line for Russia, with a total generating capacity of 4,800 megawatts. Egypt and Russia signed a deal to build the facility in 2015, and Moscow is reportedly lending Cairo \$25 billion for the project, covering 85% of the cost. Russia and China make for attractive potential partners for countries scrambling to secure sufficient power supplies.

The UN forecasts Africa’s population surging roughly 70% to 2.5 billion people in 2050, and its energy needs are expected to grow accordingly. An IEA report last month estimated Africa’s energy demand will grow 75% over the decade to 2030, and noted 600 million people still lack access to electricity. Africa now has only one commercial nuclear power station, South Africa’s Koeberg plant near Cape Town, but several other countries have plans in the works. Nigeria — Africa’s largest country by population, with more than 200 million people — opened bidding in March for a 4,000 MW nuclear power plant, and Ghana plans to choose a site for a new nuclear facility by year-end.

Russia is seen as a likely candidate for both projects. Rosatom signed cooperation agreements with Nigeria and Ghana in 2012, according to materials from the company. It has also reached cooperation agreements with

Ethiopia, home to the second-largest population in Africa, and Zambia, which has rich metal reserves, as well as inking a memorandum of understanding with Morocco in 2017. The company is helping to train nuclear engineers on the continent, and has pledged to establish technology education centers in Zambia and Rwanda.

State-owned nuclear power players in China, which views Africa as a vital source of oil, have been eyeing the continent as well. China General Nuclear Power Group agreed in 2015 to work with Kenya on building a nuclear power plant, and China National Nuclear Corp. signed a framework agreement with Sudan the following year, though it is unclear to what extent these plans have translated into concrete action. For Russia and China, nuclear cooperation is a potentially potent tool to win over countries that are rich in resources and can offer valuable diplomatic leverage. Only about half of Africa's roughly 50 countries voted in favor of a U.N. resolution in March criticizing Russia's invasion of Ukraine. ...

Source: <https://asia.nikkei.com/Business/Energy/Russia-and-China-throw-weight-behind-Africa-s-nuclear-power-drive>, July 22, 2022.

## **IRAN–RUSSIA**

### **Iran and Russia Agree to Boost Peaceful Nuclear Cooperation**

Iran and Russia agreed to strengthen cooperation in the field of peaceful nuclear development, Russia's state-owned Rosatom corporation announced. During a meeting held 11 July in Tehran between the head of the Atomic Energy Organization of Iran (AEOI), Mohamad Eslami, and the deputy director general of Russia's state-owned atomic energy corporation Rosatom, Nikolai Spassky, the two sides discussed ways to expand nuclear cooperation for peaceful purposes.

The two sides "discussed all the main issues of the current and future agenda of Russian-Iranian cooperation in the field of peaceful use of nuclear energy," Rosatom said 13 July. Reports said that during the meeting, the Iranian nuclear chief invited Rosatom Director General Alexei Likhachev to visit the Islamic Republic of Iran.

The meeting was also attended by the spokesman for Iran's nuclear body, Behruz Kamalvandi, and the Russian ambassador to Tehran, Levan Dzhagaryan. Rosatom had participated in the construction of the first unit of Iran's nuclear power plant in Bushehr (south) and is now also involved in the construction of the second and third units.

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In fact, Iran's Oil Minister Javad Oyi and Russia's Deputy PM Alexander Novak discussed bilateral cooperation in infrastructure work on phases 2 and 3 of the Bushehr plant in late May. Iran and Russia, both targets of U.S. sanctions, have made it clear that U.S. threats will not impede their legitimate and mutual bilateral cooperation. Iranian and Russian officials assure that the good ties between Tehran and Moscow and their decision to increase the level of their cooperation will render U.S. sanctions ineffective.

Source: <https://www.telesurenglish.net/news/Iran-and-Russia-Agree-to-Boost-Peaceful-Nuclear-Cooperation-20220714-0002.html>, July 14, 2022.

## **NUCLEAR ENERGY**

### **EGYPT**

#### **Construction of Egypt's First Nuclear Power Plant Under Way**

The Nuclear Power Plants Authority (NPPA), owner of the plant, submitted its application to the Egyptian Nuclear and Radiological Regulatory Authority (ENRRA) for construction permits for units 1 and 2 of the El Dabaa plant on 30 June 2021. On 30 December, it submitted application for construction licences for units 3 and 4.

ENRRA issued a construction licence for unit 1 of the plant on 29 June, ahead of schedule, allowing concrete pouring for the first reactor to commence. A ceremony was held on 20 July to mark the pouring of the first concrete for El Dabaa 1. It was attended by, among others, Egyptian Minister of Electricity and Renewable Energy Mohamed Shaker, NPPA Chairman Amged El-Wakeel and Rosatom Director General Alexey Likhachov.

“The construction launch at El-Dabaa NPP unit 1 means that Egypt has joined the nuclear club,” Likhachov said. “Construction of the nuclear power plant will allow Egypt to reach a new level of technology, industry and education development. The plant will be the largest project of the Russian-Egyptian cooperation since the Aswan High Dam. Having its own nuclear energy industry has been a dream for the Egyptian people for more than half-a-century, and it is a great honor for Rosatom to make this dream come true.”

Mohamed Shaker added: “The ceremony commemorating the pouring of the first concrete for unit 1 is a great delight for us. The commencement of full-scale construction of unit 1 is a historic event for Egypt. The political leadership and the Egyptian-Russian cooperation contributed to the implementation of this ambitious project despite the challenges presented by the COVID-19 pandemic, which did not have a negative impact on the project.”

The El Dabaa nuclear power plant project - about 320 kilometres north-west of Cairo - is based on contracts that entered into force on 11 December 2017. The plant will comprise four VVER-1200 units, like those already in operation at the

Leningrad and Novovoronezh nuclear power plants in Russia, and the Ostrovets nuclear power plant in Belarus.

The contracts stipulate that Rosatom will not only build the plant, but will also supply Russian nuclear fuel for its entire life cycle. They will also assist Egyptian partners in training personnel and plant maintenance for the first 10 years of its operation. Rosatom is also contracted to build a special storage facility and supply containers for storing used nuclear fuel.

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Source: <https://world-nuclear-news.org/Articles/Construction-of-Egyptys-first-nuclear-power-plant-u>, July 20, 2022.

## **GERMANY**

### **Germany to Reconsider Nuclear Plant Shutdown in Following Weeks**

When the war in Ukraine started, German ministers from the Greens calculated that prolonging the operation of the last three nuclear plants would be too costly and complicated. With the latest developments regarding Russia’s gas supply, they are willing to reconsider. Pressured by coalition partners and the opposition alike, Germany’s Alliance 90/The Greens is seemingly becoming more open to the idea to extend

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the operation of the country’s last three nuclear power plants. The Federal Ministry for Economic Affairs and Climate Action, run by Vice Chancellor Robert Habeck, a high-ranking member of the party, said it would perform another stress test for the national electric grid.

After the first examination, in March, following Russia’s invasion of Ukraine, the conclusion was

that keeping the three facilities working after the end of the year would bring major legal, licensing, safety and insurance issues. Widespread concerns about the lack of electricity may give room to the Greens to stop insisting on shutting down Germany's last three nuclear plants by year-end

At the time, Minister for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection Steffi Lemke, also from the Greens, opposed the extension together with Habeck. They have also said it would be difficult to obtain nuclear fuel. However, Russia has cut gas supplies to the European Union, sending prices to unprecedented highs, which prompted the government to fire up idle coal plants and postpone scheduled closures. It is uncertain whether Germany's electricity generation capacity would be sufficient to get through the winter, so concerns among the citizens and executives from major companies could open the way for the Greens to temporarily give up on the denuclearization plan.

### ***New Stress Test to be Conducted with Calculations of Greater Risks than First One:***

Habeck's ministry now said the assessment would be conducted within weeks and with greater theoretical risks than the last time. The government pointed out that the results could justify prolonging the shutdown of nuclear plants Isar 2, Emsland and Neckarwestheim 2. Together, they had a 6% share in domestic power production in the first quarter. Reuters reported, citing information from the ministry's internal document, that the stress test would include the possibility of outages in nuclear power plants in France. German nuclear power plant operators have already said they can purchase the additional reactor rods that would be necessary to keep the facilities working longer. However, they also warned the decision has to be made quickly as it takes time to reverse the ongoing shutdown process.

### ***Gazprom Declares Force Majeure Retroactively:***

Things aren't looking well for the European Union's energy security. Gazprom shut down the Nord Stream 1 gas pipeline on July 11 for ten days for

maintenance. But the resumption of supply at an agreed level is still in question. Both Uniper, Germany's biggest buyer of Russian gas, and RWE confirmed they are among the clients that Gazprom informed of a force majeure. Furthermore, the Russian company reportedly declared it retroactively from June 14, when it cut supplies through Nord Stream 1 to 40% of capacity. Germany is preparing to bail out Uniper while France offered to buy out EDF's minority shareholders for EUR 9.7 billion. The government is in talks with Uniper on a bailout. The German media learned it could take over 25% to 30% of the utility. The cost is estimated at EUR 9 billion. Additionally, water levels on the Rhine are low due to drought, impeding coal deliveries by barges.

French state-owned power utility EDF is also on the verge of insolvency. The government, which holds 84%, said that it would offer minority shareholders a total of EUR 9.7 billion to buy them out, at a premium of 53%. Aside from the gas troubles, the company has suffered a series of blows in the past year with malfunctions at several of its nuclear plants.

The market price of baseload power in France soared today to EUR 630 per MWh, an all-time high. The day-ahead price hit EUR 589.22 per MWh, a 13-year record. Germany's benchmark one-year forward contract for the delivery of electricity topped EUR 350 per MWh last week for the first time. Futures prices indicate the market doesn't expect the energy crisis to ease for another two years.

*Source: <https://balkangreenenergynews.com/germany-to-reconsider-nuclear-plant-shutdown-in-following-weeks/>, July 19, 2022.*

## **INDIA**

### **Reactor Plant Equipment Installed in Kudankulam 3**

Rosatom, whose engineering division is general designer and contractor for Kudankulam 3, said the "open top" technique was used by its Indian partners. It said the first time it was used at Kudankulam was for the reactor vessel of unit 3. Steam generators, reactor coolant pumps, main



coolant pipelines and the pressuriser have been installed in the same way.

Andrei Lebedev, vice president of projects in India for ASE JSC, said: "This technique aims at reducing the risks of equipment installation and shortening the time to do this. As evidenced by preliminary analysis, the open method results in 5-7 months of time saved. Equipment is supplied directly through the open top of the cylindrical part of the reactor building thus allowing you to reduce the number of operations performed. The current level of technology development ensures that activities are performed in alignment with all regulatory requirements." ... The expected completion dates for Kudankulam 3 and 4 are in 2023. Kudankulam 1 and 2 entered commercial operation in December 2014 and April 2017, respectively.

Source: <https://www.world-nuclear-news.org/Articles/Reactor-plant-equipment-installed-in-Kudankulam-3>, July 19, 2022.

## **JAPAN**

### **Poll Shows Close to 50% in Japan Support Restarting Some Nuclear Reactors**

Nearly 50% of people in Japan support the restart of idled nuclear reactors in the country, a Jiji Press opinion poll showed 21 July. The survey, conducted for four days through 18 July, found that 48.4% of respondents were in favor of resuming operations of nuclear reactors whose safety has been confirmed. The proportion of respondents who expressed opposition came to 27.9%, while 23.8% said they had no opinion or did not know.

Nuclear power generation in the country was completely halted after the March 2011 triple meltdown at Tokyo Electric Power's Fukushima No.

1 nuclear power plant in Fukushima Prefecture. Since then, only a fraction of the country's nuclear reactors have been brought back online. ... The interview survey covered 2,000 people age 18 or older across Japan, with valid answers collected from 61.2% of them.

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Source: <https://www.japantimes.co.jp/news/2022/07/21/national/japan-nuclear-politics-abe-opinion-poll/>, July 21, 2022.

### **Japan Hopes to Restart 4 More Nuclear Reactors by Winter**

Japan hopes to restart four more nuclear reactors in time to avert any power crunch over the winter, industry minister Koichi Hagiuda said on 15 July, a week after the pro-nuclear ruling party won a resounding victory in upper house elections. "We would like to ensure the operation of a maximum of nine reactors, up from the current five operating now, by revising the construction and inspection periods for some of the nuclear power plants," Hagiuda told a news conference.

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... A nuclear restart still requires an extensive approval process overseen

by regulators, as well as approval from local communities. Flaring tensions with Russia have also put Japan on edge. A decree issued by President Putin in late June that seizes control of gas and oil project Sakhalin-2 has threatened to cut off a crucial source of gas supplies for Japan. Gas Association chairman Takehiro Honjo said there were no immediate concerns over the supply of gas. Sakhalin-2 supplies 9% of Japan's liquefied natural gas.

Source: <https://www.zawya.com/en/world/china-and-asia-pacific/japan-hopes-to-restart-4-more-nuclear-reactors-by-winter-pb879kdd>, July 15, 2022.

**TURKEY**

**Construction Begins of Fourth Turkish Reactor**

A construction licence for Akkuyu 4 was granted by Turkey’s Nuclear Regulatory Authority in October 2021. The pouring of first concrete was preceded by a wide range of preparatory work which included dewatering, excavation of a basement pit, installation of a concrete cushion and waterproofing, reinforcement of the basement and installation of embedded parts.

A ceremony was held at the Akkuyu site to mark the milestone of the first concrete to be poured. Attendees included Turkish Minister of Energy and Natural Resources Fatih Dönmez; Chairman of the Energy Commission of the Grand National Assembly of Turkey Ziya Altunyaldız; Rosatom Director General Alexey Likhachov; Akkuyu Nuclear JSC Director General Anastasia Zoteeva; Governor of Mersin Province Ali Hamza Pehlivan; Deputy Minister of Energy and Natural Resources of Turkey Alparslan Bayraktar; Head of the General Directorate of Nuclear Energy and International Projects, Ministry of Energy and Natural Resources Afpin Burak Bostancı; and President of Turkey’s Nuclear Regulatory Authority Zafer Demircan.

In total, some 17,000 cubic metres of concrete will be used to create a 2.6-metre-thick basemat for the reactor building. Rosatom is building four VVER-1200 reactors at Akkuyu, under a so-called BOO (build-own-operate) model. Construction of units 1-3 began in April 2018, April 2020 and March 2021,

respectively. The first unit is due to start operations in 2023, which is the centenary of the founding of the Turkish Republic.

“When completed, the four reactors will meet 10% of our electricity demand,” Dönmez said. “Akkuyu will play an important role not just through the electricity generation, but also with its contribution to our green energy goal. Akkuyu will prevent 35 million tonnes of greenhouse gas emissions per year, and a total of 2.1 billion tonnes of greenhouse gas emissions during its 60 years of operation....

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Source: [https://www.world-nuclear-news.org/Articles/](https://www.world-nuclear-news.org/Articles/Construction-begins-of-fourth-Turkish-reactor)

*Construction-begins-of-fourth-Turkish-reactor, July 21, 2022.*

**USA**

**No Power Technology can Replace or Do the Job of Nuclear Energy Today**

There is no technology that can replace nuclear energy today, Lynn Good, CEO of Duke Energy, told CNBC’s Jim Cramer at the Evolve Global Summit on 13 July. Nuclear energy, which is produced from the splitting of uranium atoms in a process called fission, accounts for about 20% of America’s electricity.

**Duke Energy, which operates out of Charlotte, North Carolina, is an American electric power and natural gas holding company, which distributes energy to 7.2 million customers. And in the Carolinas, 50% of that electricity comes from nuclear energy plants. “I do not have a technology that can replace that today,” Good said. Nuclear energy does not produce greenhouse gas emissions, making it a leading source of clean energy, and a valuable resource in the transition to net zero – accounting for 56% of our nation’s carbon-free electricity.**

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energy to 7.2 million customers. And in the Carolinas, 50% of that electricity comes from nuclear energy plants. “I do not have a technology

that can replace that today," Good said. Nuclear energy does not produce greenhouse gas emissions, making it a leading source of clean energy, and a valuable resource in the transition to net zero – accounting for 56% of our nation's carbon-free electricity. But nuclear has many detractors, focused on the risks and history of catastrophic incidents. The U.S. has been slow to build new nuclear power plants, and some states and utilities, including Duke Energy, have moved to shut down existing nuclear sites. Good said there is no energy solution available today without an environmental impact. Coal and natural gas produce emissions, and mining for renewables and batteries have environmental costs. ...

Duke Energy is investing in smaller modular reactors, a technology approach that Gates backs, to see if they can reach the point of commercialization by the 2030s, she said. Good's view of nuclear is part of a larger argument that the transition to clean energy cannot be accomplished without a commitment to both reliability and affordability, and these three factors together make nuclear a part of the mix. No energy technology, she said, should be the sole focus of a transition to clean energy. ...

Source: <https://www.cnn.com/2022/07/13/no-technology-can-replace-nuclear-energy-today-says-duke-energy-ceo.html>, July 13, 2022.

## **URANIUM PRODUCTION**

### **NAMIBIA**

#### **Paladin to Restart Langer Heinrich Uranium Mine**

Langer Heinrich is located in the Namib Desert 80 kilometres east of the major seaport of Walvis Bay and 40 km south-east of Namibia's - and the world's - longest running open pit uranium mine, China National Uranium Corporation's Rössing. Production commenced in 2007 with a capacity of 2.7 million pounds U3O8 (1039 tU) per year.

This was subsequently expanded to 3.7 million pounds in 2009 and 5.2 million pounds in 2012, but following the continued decline in uranium prices, a mining curtailment strategy was introduced in November 2016 and in May 2018 the mine was transitioned to full care and maintenance. The mine produced more than 43.3 million pounds U3O8 over its ten years of previous operations. "The decision to restart production at the Langer Heinrich mine is supported by strong uranium market fundamentals and continued progress on uranium marketing activities, including the execution of a binding contract for the previously announced Tender Award" Paladin said.

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The company noted the capital cost to restart production at Langer Heinrich has increased from the previous estimate of USD87 million to USD118 million, "primarily driven by recent inflationary pressures

across the project supply chain, brought forward power and water infrastructure works and increased owners team costs". Paladin owns 75% of Langer Heinrich Mauritius Holdings Limited, the holding company of Langer Heinrich Uranium (Pty) Ltd that holds 100% of the Langer Heinrich tenements. The remaining 25% is owned by CNNC Overseas Uranium Holdings Limited.

Paladin said it has committed to provide 100% project funding, if required, via priority loans to be repaid in priority to all outstanding shareholder loans. It added that CNNC Overseas Uranium Holding Ltd "are yet to finalise their funding decision". "The significant and detailed planning for the recommencement of activities at the Langer Heinrich mine has provided a detailed scope of the key work activities and critical path items for the successful commencement of production," Paladin said. "Current work packages include the completion of detailed engineering and design for process upgrades, purchase of project materials and equipment and the

commencement of plant refurbishment and upgrade works.”

Paladin has appointed South Africa-based engineering firm ADP Group to provide engineering, procurement and construction management services. The ADP Group will work alongside Paladin’s team as a delivery partner, with responsibilities including: detailed design and engineering; tendering for the procurement of equipment and materials; project management and administration of contracts; provision of systems and computer software; and managing project commissioning and project handover. ...

Source: <https://www.world-nuclear-news.org/Articles/Paladin-to-restart-Langer-Heinrich-uranium-mine>, July 19, 2022.

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Macron Says Iran Nuclear Deal ‘Still Possible’**

French President Macron on 30 July told his Iranian counterpart Ebrahim Raisi that reviving the landmark 2015 deal on Tehran’s nuclear capabilities was “still possible” but must happen “as soon as possible”. Macron also “expressed his disappointment” at the absence of progress after the suspension of talks in Vienna and underlined the need for Iran to return to the accord and implement its nuclear commitments, according to a French presidency statement.

The French leader’s telephone call with Raisi comes as negotiations in Vienna between Iran and world powers including the US have stalled since March. ...The Iranian presidency, said Raisi, “condemned the unconstructive positions and actions of the US and European countries” during his two-hour conversation with Macron on 30 July. Last week, an Iranian official said Tehran had the technical capacity to make a nuclear bomb but

clarified that it had not decided to make any. The Iranian foreign ministry said there was “no change” in its nuclear policy, referring to an Islamic ruling that forbids “arms of mass destruction”....

Source: <https://www.barrons.com/news/macron-says-iran-nuclear-deal-still-possible-statement-01658608506?tesla=y>, July 23, 2022.

**Hours after the press conference on 28 July, Iran’s President Raisi said his country would have a “harsh and regrettable” response to any mistake from Washington and its allies. While indirect talks between the US and Iran remain at loggerheads, Mr Biden once again said he hoped Iran would agree to a new pact and that diplomacy was the best way to ensure Iran didn’t make nuclear weapons.**

#### **Biden, Lapid Sign US-Israel Pledge to Deny Iran Nuclear Weapons**

US President Biden and Israeli PM Yair Lapid on 28 July signed a pledge to prevent Iran from developing nuclear weapons, including by force if needed. Standing on matching lecterns with US and Israeli flags

waving on twin LED screens in the basement of the Waldorf Astoria, Mr Biden vowed to protect Israel and deepen military co-operation as part of a new “Jerusalem Declaration” one day after telling local media that a “last resort” use of force against Iran was on the table.

“We will not allow Iran to acquire a nuclear weapon,” Mr Biden told a news conference following the signing of the declaration that stated that the US was “prepared to use all elements of its national power to ensure that outcome.” Mr Biden said he was seeking to deepen the Obama administration’s record \$38 billion, 10-year commitment to Israeli security with new collaboration on defence projects such as laser interceptors. ...

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its enrichment of uranium is in pursuit of a warhead.

"We've laid out for the leadership of Iran what we're willing to accept to get back into the JCPOA [Joint Comprehensive Plan of Action]," Mr Biden said. "We're waiting for their response. When that will occur, when that will happen, I'm not sure But we are not going to wait forever." US officials have warned that if Iran fails to agree to a deal then more sanctions and other curbs would be announced. Mr Lapid, whose country has long said it retains the right to decide how it chooses to respond to the Iranian threat, said "the only thing that can stop Iran is knowing the free world will use force to stop them." In an interview with Israel's Channel 12, broadcast on 13 July evening, the US leader said he was prepared to use force as a "last resort" against Iran. The US also promised to work with other partners in the region "to confront Iran's aggression and destabilising activities". ...

Source: <https://www.thenationalnews.com/mena/2022/07/14/biden-rules-out-nuclear-weapons-for-iran-in-joint-declaration-with-israel/>, July 15, 2022.

## NUCLEAR DISARMAMENT

### JAPAN

#### Japan PM Kishida's Vision of a World Free of Nuclear Weapons

On Aug. 1, PM Fumio Kishida will become the first Japanese PM to address the NPT review conference in New York. It is rare for national leaders to take part in NPT review conferences, which are usually held every five years, and Kishida's participation will highlight his enthusiastic commitment to nuclear issues. Kishida also will host the G7 summit when it is held in Hiroshima on May 19-21 next year. Both

events will be stages on which we will be able to see whether there is a way forward for Kishida's vision of a world without nuclear weapons.

Addressing the NPT conference will give Kishida a concrete starting point as PM to continue his lifework on nuclear disarmament and abolition. In his speech, Kishida will emphasize his determination to serve as a bridge between nuclear-weapon states and non-nuclear-weapon states and will call for cooperation in achieving a "world without nuclear weapons."

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Kishida attended the previous NPT review conference, held in New York in 2015, as foreign minister. Despite Japan's best efforts, the conference concluded without the

signing of an outcome document. Kishida has said that failing to reach an agreement on the document was unfortunate and that he believes showing forward movement at an NPT review conference would have been an important step toward nuclear disarmament and abolition.

Kishida was elected to the House of Representatives from a constituency in Hiroshima. The city is known for being struck by an American atomic bomb on Aug. 6, 1945, the first time such a weapon was ever used in war. With Hiroshima as his home electoral ground, Kishida is well-known for his progressive vision on nuclear issues, a view not shared by many of his fellow conservatives in the Liberal Democratic Party.

To achieve nuclear disarmament and the abolition of nuclear weapons, Kishida intends to take realistic measures. For instance, he is cautious about Japan's becoming an observer to the Treaty on the Prohibition of Nuclear Weapons due to the nuclear powers' abstention from participating in that treaty. For Kishida, it is critical to maintain a healthy relationship with the US, Japan's only formal ally and the provider of the nuclear umbrella on which Japan depends for its security. Kishida once told an aide that even with the

nuclear issue in mind, Japan's relationship with the U.S. remains paramount.

Kishida demonstrated his realistic approach to this issue during his meeting with U.S. President Biden in Tokyo on May 23. The two released the Japan-U.S. Joint Leaders' Statement in which both leaders reaffirmed their intent to work together toward a world without nuclear weapons. The statement also specified that the president reiterated the U.S. commitment to the defense of Japan backed by the full range of American capabilities, including its nuclear arsenal.

One notable highlight from the statement is the section on China, in which the two leaders requested that China contribute to arrangements that reduce nuclear risks, increase transparency, and advance nuclear disarmament. Kishida prioritized the inclusion of China's nuclear issues in the statement. A senior official told me after Kishida and Biden met that the PM succeeded in striking a balance on the nuclear issues. Kishida also received Biden's approval on hosting next year's G7 Summit in Hiroshima. The PM aimed to ensure that all G7 members, including the nuclear powers of the US, Britain and France, agree on the decision to host the summit in Hiroshima.

Kishida continued to call for China's nuclear disarmament in his keynote address at the IISS Shangri-La Dialogue on June 10. At the event, the PM told the audience that Japan will support the dialogue on nuclear disarmament and arms control between the US and China, alongside other concerned countries.

At the final meeting of the G7 Summit in Elmau, Germany, on June 28, the PM spoke as next year's chairman, recognizing that "the world is facing the unprecedented crisis of the invasion of Ukraine and the increased risk of the use of weapons of mass destruction." He then said regarding the upcoming Hiroshima summit: "I

would like to show the G7's intention to categorically reject armed aggression, threats from nuclear weapons, and attempts to overthrow the international order."

... As Kishida said, the path to a world without nuclear weapons has become even more challenging, and the situation surrounding nuclear arsenals is growing severe. Russian President Putin, who invaded Ukraine, has mentioned the possibility of using nuclear weapons, and North Korea continues its nuclear and missile development. China, meanwhile, has been opaquely increasing its nuclear forces. The SIPRI reports that the number of nuclear weapons in the

world will likely increase in the next decade, indicating that the period of the post-Cold War nuclear drawdown is ending.

Considering the harsh security environment, Kishida will continue to promote his ideals while also continuing to increase the credibility of the U.S. "extended deterrence" that protects Japan with military power, including the U.S. nuclear arsenal. This raises the question; how can we gain the understanding of nuclear-weapon states and show the path to nuclear disarmament and abolition while still ensuring the deterrence of the Japan-U.S. alliance? ...

Source: <https://www.thestatesman.com/world/path-kishidas-vision-1503092922.html> July 23, 2022.

## NUCLEAR SAFETY

### INDIA

#### No Safety Issue in Design of 700 MW PHWRs, Kakrapar Atomic Plant

An indigenously developed 700 MW nuclear power plant at Kakrapar in Gujarat is expected to start commercial operations by December, Union Minister Jitendra Singh said on 27 July. In a written reply to a

question in Lok Sabha, Singh said during the commissioning of Unit 3 at Kakrapar Atomic Power Station, elevated temperatures were observed in certain areas of the reactor building which have since been addressed by carrying out requisite modifications and improvements.

The NPCIL is building two 700 MW PHWRs at Kakrapar, which is also home to two 220 MW power plants. There are no design flaws or safety issues in the design of indigenous 700 MW PHWRs, Singh said. He said in Unit-3, modifications/improvements required based on commissioning feedback have been carried out and their validation was also completed by the hot run. The unit is now being readied for startup and progressive power raise to full power in line with the regulatory clearances, he said. The unit is expected to commence commercial operation by December 2022, after obtaining stage-wise regulatory clearances, Singh said in response to a question put by Lok Sabha member from Thiruvananthapuram Shashi Tharoor.

Singh also informed that Unit-4 at Kakrapar has achieved physical progress of 93.65 per cent as of June this year. Among the other 700 MW PHWRs under construction, Rajasthan Atomic Power Project (RAPP) 7 and 8 at Rawatbhata have achieved physical progress of 95 per cent and 80.8 per cent respectively. In respect of Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP) 1&2 at Gorakhpur, Haryana, various buildings and structures are under construction. In the ten PHWRs Kaiga 5&6 at Kaiga in Karnataka, GHAVP 3&4, Mahi Banswara 1 to 4 in Rajasthan and Chutka 1&2 at in Madhya Pradesh, pre-project activities at sites and

procurement of long delivery equipment have been undertaken, Singh said. The minister said excavation has also commenced at Kaiga units 5&6 in Karnataka.

Source: <https://www.news18.com/news/india/no-safety-issue-in-design-of-700-mw-phwrs-kakrapar-atomic-plant-to-start-commercial-ops-by-dec-govt-5593039.html>, July 20, 2022.

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## **UKRAINE**

### **Australis Provides Nuclear Safety Assistance to Ukraine**

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and Australian Nuclear Science and Technology Organisation (ANSTO) have coordinated with the IAEA

to donate radiation measurement and personal protective equipment to Ukraine.

Dr Marcus Grzechnik, ARPANSA's Director of Modelling, Assessment and Emergency Preparedness, said the equipment will contribute to radiation protection and nuclear safety in the

region. 'Australia is a leading nation in nuclear safety and radiation protection and we were pleased to be able to contribute to global efforts to support Ukraine to maintain a safe environment and protect workers and communities.' 'The equipment provided

will allow workers to monitor radiation in the event of a nuclear incident and assist in the replacement of stolen or damaged equipment.'

This donation forms part of the IAEA's wider call for international support, which has been answered with contributions from many countries. 'We're glad to have had the opportunity to coordinate with ANSTO and other government colleagues to support the safe transport of this

important equipment to Ukraine.' The equipment formed part of Australia's emergency response capability but is surplus to requirements at this time. The delivery was received by the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) in Kyiv on 13 July. 'Despite the distance, Australia's delivery was amongst the first to be received by Ukraine under the IAEA program,' said Dr Grzechnik. ...

Source: <https://www.arpansa.gov.au/news/australia-provides-nuclear-safety-assistance-ukraine>, July 21, 2022.

## **NUCLEAR WASTE MANAGEMENT**

### **SOUTH KOREA**

#### **Korea to Earmark \$1.1 bn to Develop High-Level Nuclear Waste Management**

South Korean government with a goal to rebuild reactor habitat and sustain supremacy will invest 1.4 trillion won (\$1.07 billion) on self-developed system on high-level radioactive waste treatment by 2040 and establishment of the facility by 2060. The Ministry of Trade, Industry and Energy on 27 July announced the roadmap for research & development for high-level radioactive waste management, the first state blueprint of the kind to complete commercial nuclear power self-sufficiency from generation to reliable waste control.

Of total 1.4 trillion won, 900.2 billion won will be spent to develop nuclear waste transport, storage and treatment technologies and 493.6 billion won to build related infrastructure. With the investment, it aims to develop Korea's own radioactive waste treatment system in consideration of domestic waste and underground

characteristics. ...

It is the follow-up measure to the second basic plan for high-level radioactive waste management announced late last year. The energy ministry plans to study candidate sites for the high-level radioactive waste treatment plant in the next 13 years starting next year

to choose locations in 2036. Under the roadmap, it aims to build interim storage facilities in 2036-2043 and underground disposal facilities in 2043-2060. The Korean government is accelerating the nuclear waste management project as its treatment facilities are necessary to expand power sourcing from nuclear plants.

In Korea, spent nuclear fuels have been piling up since the first reactor Kori-1 became operational in 1978. Nuclear fuel in light-water reactors must be replaced every 10 months and heavy-water ones every 10 months. Spent nuclear fuels currently are stored and managed separately at temporary storage facilities of each plant. The storages at Kori and Hanbit reactors will reach their brim by 2031 and at Hanul reactors by 2032.

Source: <https://pulsenews.co.kr/view.php?year=2022&no=642934>, July 21, 2022.

### **USA**

#### **Idaho Nuclear Waste Treatment Plant Making Progress**

A nuclear waste treatment plant in eastern Idaho designed to treat 900,000 gallons (3.4 million liters) of sodium-bearing, radioactive waste that has had numerous setbacks appears to be making progress, officials said. The U.S. Department of Energy said that the Integrated Waste Treatment Unit at the department's 890-square-mile (2,300-square-kilometer) site that includes the Idaho

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National Laboratory recently treated more than 100,000 gallons (380,000 liters) of simulant over seven weeks. "The plant has operated extremely well during this several-week run," Bill Kirby of the Idaho Environmental Coalition, an Energy Department contractor, said in a statement. "Our staff has done an outstanding job managing all facets of the facility."

The department plans additional testing and then a shutdown to make sure the plant is ready for radioactive waste. The department said increasing amounts of radioactive waste will be mixed with simulant when the plant is fully operational. The department didn't give a timeline. The Integrated Waste Treatment Unit has been beset with problems for years as scientists have struggled with the highly complex problem of converting the liquid waste into a more easily managed granulated solid. The liquid waste came from processing spent nuclear fuel to recover highly enriched uranium. The waste is in tanks above the Eastern Snake Plain Aquifer that supplies water to cities and farms.

The department is paying fines to Idaho for missing a deadline to convert the liquid waste into solid material as stipulated in a 1995 agreement that was the culmination of a series of federal lawsuits. Idaho, because of the missed deadline, is preventing the department from bringing in research quantities of spent nuclear fuel to be studied at the lab. If the treatment plant is successful, the granulated waste will be stored at the plant in stainless steel canisters placed in concrete vaults that will eventually be disposed at a national geologic repository. However, no such repository currently exists.

Source: <https://apnews.com/article/technology-idaho-us-department-of-energy-nuclear-waste-treatment-4291c5270c3ae00ac4db55a6c3d97fbc>, July 16, 2022.

## **R&D Set to Minimise Waste Volumes**

Nearly a dozen research projects have received funding from the US Department of Energy (DOE) as part of a programme aimed at limiting the volume of waste from the new generation of advanced reactors. The Optimizing Nuclear Waste and Advanced Reactor Disposal Systems (ONWARDS) scheme was first announced last year to identify and facilitate technologies for advanced reactor used nuclear fuel (UNF) recycling, disposal and associated safeguarding technologies. Projects funded through the ONWARDS programme will develop technologies

that can resolve the waste and storage challenges associated with advanced reactor fuel cycles. The goal is to reduce nuclear waste and to support safer and more sustainable domestic fuel stocks. In the latest round of funding the DOE has pushed another US\$36 million into the Advance

Research Projects Agency-Energy (ARPA-E) programme.

**Taking a Good Look at Waste:** Among the 11 projects which have received funding, GE General Electric Global Research was granted nearly US\$4.5 million for a project that will develop an innovative inspection technique for use in nuclear reprocessing facilities. Resonance Absorption Densitometry for Materials Assay Security Safeguard (RADMASS) is designed to address the challenge of inspecting spent fuel which is stored at various storage sites across the US. RADMASS is a non-destructive evaluation technique that will be able to accurately measure and characterize this material for more cost-effective reprocessing. The objective of the project is to demonstrate a proof of concept in a non-radiation environment with photonics and nuclear modelling proving the ability of RADMASS to operate in a high radiation environment such as a nuclear fuel reprocessing radiation containment chamber.

Dr. Andrew K. Hoffman, Materials Research Scientist at GE Research and principal investigator

**The U.S. Department of Energy said that the Integrated Waste Treatment Unit at the department's 890-square-mile (2,300-square-kilometer) site that includes the Idaho National Laboratory recently treated more than 100,000 gallons (380,000 liters) of simulant over seven weeks.**

on this project, says: "One of the most exciting factors about the advanced nuclear reactor concepts coming online is the opportunity to optimize how the industry can recycle fuel in the future. With new advanced reactor concepts creating more recycling opportunities, we need to seize the moment in making nuclear an even more attractive, carbon-free energy alternative." A further US\$8.5 million was awarded to TerraPower for a project which aims to reduce waste volumes using chloride salts at high temperatures. The goal of the Chloride-Based Volatility for Waste Reduction and/or Reuse of Metallic-, Oxide-, and Salt-Based Reactor Fuels project is to adjust chloride-based volatility (CBV) parameters to achieve a high degree of uranium recovery.

By doing so waste volumes will be significantly reduced. With prior work having already demonstrated recovery of more than 99% of the

uranium from irradiated oxide fuel, it may be possible to reduce repository burdens by a factor of 10-20 times, TerraPower says. The work will start with surrogate UNF and progress to actual oxide UNF in a demonstration of the process which can be applied to metallic-, oxide- and salt-based reactor fuels. "We are actively exploring new solutions across the fuel cycle, including the best way to address used fuel," said TerraPower President and CEO Chris Levesque.

**Rock on with Waste:** In a project getting more than US\$3 million in ARPA-E funding Citrine Informatics, Pacific Northwest National Laboratory, and University of North Texas will use artificial intelligence and simulation methods to develop novel phosphate waste materials that significantly reduce repository burden from molten salt reactors. The aim of the project is to rapidly develop phosphate glasses, ceramics, and their composites to enable removal of halides and the more secure immobilization of salt waste from

**Pacific Northwest National Laboratory, and University of North Texas will use artificial intelligence and simulation methods to develop novel phosphate waste materials that significantly reduce repository burden from molten salt reactors. The aim of the project is to rapidly develop phosphate glasses, ceramics, and their composites to enable removal of halides and the more secure immobilization of salt waste from molten salt reactors.**

molten salt reactors. The programme hopes to culminate in a kg-scale proof-of-concept of a designed waste form and to demonstrate a more than six times increase in waste mass loading and an 80% decrease in waste volume when compared with existing technologies. The proposal will also result in 60% decrease in the capital and operating expenditures of waste form processing, Citrine says.

...Orano subsidiary Orano Federal Services (FS) is to receive \$2.2 million in project funding to develop a modular off-gas treatment unit. The 'plug and play' unit will be tailored to the off-gases created when processing used nuclear fuel from different advanced reactor types, including metal fuel, TRISO fuel, and molten salt reactor liquid fuel. Optimised to efficiently capture regulated radioactive and non-radioactive off-gases, the treatment processes will

themselves only generate low-level waste suitable for either disposal or decay storage. Principal investigator Dr Sven Bader will be working with the state-of-the-art research and development performed by Oak Ridge National Lab (ORNL) and Pacific Northwest National Laboratory (PNNL) in the off-gas treatment. "Advanced reactors will require advanced processes for preparing their used nuclear fuel to be reused. We appreciate this opportunity to...work with ONWARDS in support of the next generation of advanced reactors," said Dr Dorothy Davidson, Orano FS president.

**A Case for Study:** Among a number of projects underway at academic institutions, the New Brunswick, New Jersey site of Rutgers University is receiving grant funding worth US\$4 million for the Pioneering a Cermet Waste Form for Disposal of Waste Streams from Advanced Reactors (PACE-FORWARD) project. The University aims to deliver a simple, scalable route for immobilizing multiple

waste streams like metals, salts and carbon into a singular, high-density, durable cermet. The goal is to encapsulate waste emanating from any potential advanced reactor fuel cycle into a heat-resistant ceramic and metallic composite waste form.

The cermet will comprise stainless steel waste as the primary phase, encapsulating a ceramic phase dispersed homogeneously throughout the metal matrix. It will

be consolidated to reduce porosity. The PACE-FORWARD technology will substantially minimise processing of waste streams by eliminating the need to develop multiple waste forms for separate waste streams, Rutgers says. The process will also reduce the repository footprint by around an order of magnitude compared with light water reactor technologies. It is designed to be suitable for multiple disposal environments and is also expected to reduce production and operation and maintenance costs by around 50% when compared with current incumbent technologies, they add.

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Another academic project funded under the ARPA-E scheme is the US\$3.4 million Matrix Engineered TRISO Compacts Enabling Advanced Reactor Fuel Cycles (MATRICY) project underway at Stony Brook University in New York. Their proposal centres on a comprehensive systems approach to significantly reduce the waste burden by improving fuel utilization and reducing uranium loading. This approach considers the use of a TRISO-based micro-encapsulated fuel employing MgO as a low-waste and repository-ready fuel form. MATRICY will engineer the TRISO fuel to enable deconsolidation of intact particles. At the same time the project will evaluate it as a final waste form for long-term disposition.

The Stony Brook team will couple reactor analysis

with a programme to fabricate and understand the performance of the new fuel and its waste forms. They aim to realise more than an order of magnitude reduction in nuclear waste compared with current state-of-the-art technologies. Meanwhile, the University of California, Berkeley, the Lawrence Berkeley National Laboratory and NAC International are working in partnership with Deep Isolation on the UPWARDS programme with more than US\$3.6 million of ARPA-E funding.

The Universal Performance Criteria and Canister for Advanced Reactor Waste Form Acceptance in Borehole and Mined Repositories Considering Design Safety (UPWARDS) project is looking to establish a novel universal canister system for advanced reactor waste streams. This new canister will create an elemental waste form that will decouple the interdependent constraints that exist between storage, transport, and disposal, the partners state. Designed to be compatible with current dry storage and transportation infrastructure, the new

canister will also meet the thermal, volumetric and criticality waste acceptance constraints of Deep Isolation's deep borehole solution. The goal is to minimise the long-term costs of used fuel and waste management by packaging waste in small canisters that can be dry stored on site or centrally, transported to a geologic repository, and disposed of without repackaging.

Deep Isolation is also partnering with another group receiving ARPA-E funding. In an Oklo-led project – Enabling the Near-term Commercialization of an Electrorefining Facility to Close the Metal Fuel Cycle – the partners aim to commercialise a nuclear fuel recycling facility within the next few years. This facility will produce fuel for Oklo's metal-fuelled reactors and close

the advanced reactor fuel cycle. ARPA-E funding worth US\$4 million will allow the partners to focus on industrialising and automating the key processes of an electrorefining facility used for recycling nuclear fuel. That will address each key operation and demonstrate the end-to-end process with simulated fuel. The project will also prepare the facility for NRC licensing and establish a plan for the final deep borehole repository disposal of any waste resulting from the process. This technology is expected to reduce waste by more than an order of magnitude compared with a no-reprocessing baseline. In addition, ONWARDS aims to advance development of high-performance waste forms while maintaining back-end costs in the accepted range of US\$1/MWh, its backers claim.

... Smaller projects are also underway at Brigham Young University - Two-Step Chloride Volatility Process for Reprocessing Used Nuclear Fuel from Advanced Reactors; Idaho National Laboratory -

Traveling Molten Zone Refining Process Development for Innovative Fuel Cycle Solutions; and the Rensselaer Polytechnic Institute - Metal-Halide Perovskites as Innovative and Cost-Effective Fluoride Salt Waste Forms. These projects round out the 11 which are receiving funding under this round of ARPA-E funding.

All these research projects seek to increase the deployment and use of nuclear power as a reliable source of clean energy by limiting the volume of waste produced from Advanced Reactors. By mitigating waste and storage concerns, the goal is to support clean energy infrastructure and pave the way for a new era of nuclear energy. Indeed, the DOE recently released a supply chain report noting that the development of fuel and an integrated waste disposal strategy for advanced reactor technologies are significant factors in supporting further nuclear energy deployment. ...

*Source: <https://www.neimagazine.com/features/featurerd-set-to-minimise-waste-volumes-9865389/>, July 21, 2022.*



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