



**OPINION – Alex Gilbert**

**Vol 16, No. 08, 15 FEB 2022**

**The Opportunity Cost of not Using Nuclear Energy for Climate Mitigation**

The biggest obstacle to addressing climate change is that it requires a sustained whole-of-society effort, yet we are still fighting about its seriousness and urgency. The second biggest obstacle is that those of us who see climate change as an existential threat are fighting over whether to take a technology-inclusive approach or to rely solely on renewables. Those of us who advocate for a technology-inclusive approach think we need enormous growth in renewables. We just do not think renewables can do it all. Rather, we'll need all of the available low- or no-carbon tools (and many new technologies that we have yet to develop) to do this work, not just one.

A recent U.N. report found that nuclear energy has the lowest lifecycle carbon emissions of any energy technology, underscoring its role as the largest source of carbon-free power in the U.S. and the second largest source globally. Yet some opponents of nuclear power are trying to argue that the “opportunity cost” of investing in nuclear power is too high, and that we should focus entirely on investment in renewable energy. This is a recipe for climate disaster. Focusing on renewable energy

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while ignoring all other low or zero carbon technologies is based on an incorrect understanding of decarbonization imperatives, system-level energy costs, and investment portfolio principles. Based on the best available facts and analysis, like MIT, Sepulveda et. al., and Vibrant Clean Energy, a broad technology portfolio that includes both nuclear and renewable energy can create the most cost-effective carbon-free energy systems.

The core of a “renewables alone” argument is that because individual wind and solar power plants are now estimated to be

cheaper on a generic levelized basis, any money spent on nuclear energy is wasted because it could have gone to renewables instead. Nuclear construction projects in the United States, like in Georgia and South Carolina, have indeed struggled with large upfront construction costs and cost overruns (even as plants abroad have been delivered at competitive costs). Since new nuclear energy and existing nuclear plants may struggle in competition with natural gas in absence of a carbon price, the proposed solution is to refocus any support for new or existing nuclear energy in favour of renewable energy.

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**There are Three Major Flaws in this “Renewables alone” Argument:** First, the argument misses the clear bigger picture: the world is still dependent on carbon-emitting energy sources. Despite recent substantial growth in renewable energy, global carbon emissions continue to rise. It is urgent and imperative that we curb and reduce global carbon emissions as quickly as possible. In the power sector, numerous energy models and analyses show that nuclear and renewable energy are complementary in achieving deep decarbonization goals, especially as next generation nuclear energy can be flexible to balance renewable’s variability. While renewable energy can help satisfy large portions of our energy needs, eliminating carbon emissions from energy production without “firm” low carbon energy sources like nuclear power will be extremely costly.

**The “renewables alone” argument relies upon the wrong cost metric, using costs of power produced by individual plants instead of power system-level costs. The electric grid functions like a giant machine that must balance the power supplied by all the individual power plants with the demand from all electricity users across all hours of all days.**

Renewable energy should be a means to reducing emissions, not an end in itself. And in the power sector, such emissions must be calculated on a system-wide basis. With careful attention to system integration, renewable energy can play a

major role in reducing emissions. However, in some cases, variable renewable energy can actually increase emissions due to system-wide operational inefficiencies at balancing fossil units. In the United States, closures of nuclear power plants in Vermont, New York and elsewhere have led to increased natural gas use and greenhouse gas emissions.

Recent analysis indicates that competition with natural gas has led to the closure of almost 10% of U.S. reactors in the last decade with another 20% only saved by state policy interventions. Keeping reactors online with state or federal policy has relatively limited costs, while ensuring that additional renewable energy can focus on displacing high-emitting energy sources. Indeed, key swing vote Senator Joe Manchin recently indicated that he is “big on nuclear,” expressing support for federal policy to support plants. Combining nuclear energy and renewable energy interests can thus lead to stronger political coalitions that deliver outcomes for all, just as recently occurred in Illinois.

Second, the “renewables alone” argument relies upon the wrong cost metric, using costs of power produced by individual plants instead of power system-level costs. The electric grid functions like a giant machine that must balance the power supplied by all the individual power plants with the demand from all electricity users across all hours of all days. Costs of energy for individual power plants are useful, but have severe limitations in analysing real-world economic realities. Power costs for individual renewable energy plants do not account for transmission costs, a rising and largely unaddressed financial barrier, nor for the system balancing costs to deliver electricity supply as needed. Further, renewable energy and nuclear

energy are not direct competitors in most energy markets or utility decision-making – they serve different purposes on the electric grid.

The “renewables alone” arguments use the wrong metric for comparing different climate solutions; even though we want as much clean power as possible, the primary metric is not dollars per clean megawatt-hour for a particular power plant. Rather, it is dollars per ton of mitigated greenhouse gas emissions. By focusing narrowly on a comparison of costs per MWh between lower-emitting power plants, this argument misses that system-level

outcomes are what determine greenhouse gas reductions. For example, if renewable energy were to be built in Germany while closing nuclear power plants, it would miss out on emissions reductions from replacing coal in Germany, or emissions reductions from redirecting renewable supply chains elsewhere. This system-level outcome should be our focus.

The total costs of energy systems are also just one important societal consideration for a future clean energy system. Other considerations include energy security, diversity, reliability, resilience, environmental justice, land use, materials, other lifecycle impacts and more. These are often system-level features, meaning that they are derived from the individual characteristics of technologies operating together. Research has shown again and again that diversification of energy resources, like a balance of renewables and nuclear energy, is the best way to maximize outcomes across all of these characteristics. Existing nuclear plants often have limited lifecycle costs involved, so keeping them online with policy

support can have some of the lowest carbon mitigation costs. In an integrated energy system, limitations of nuclear energy are offset by the advantages of renewable energy just as limitations of renewable energy are offset by the advantages of nuclear energy. Together, they make our grid stronger.

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Third, and finally, a “renewables alone” argument focused on the opportunity cost of investment in nuclear energy ignores investment portfolio principles for achieving long term success. We need to invest in a portfolio of promising solutions, because the

climate is too important to bet on just one technology.

Solar, wind and other renewables have made great strides in the power sector, but not other sectors.

**The opportunity cost argument also makes a fundamental mistake regarding energy portfolios by asking the wrong question. If we asked what the cheapest technology was to decarbonize in 2001, no one would have said wind or solar, whose prices were way too high. With strong demand-pull policies and a competitive market, both industries were able to reduce costs to become global leaders in decarbonization.**

Next generation nuclear energy is uniquely suited to decarbonize other sectors that lack renewable alternatives. Nuclear energy is already providing heat in cogeneration and district heating around the world, roles it can expand upon. The firm generation nature of nuclear energy is well suited for powering hydrogen electrolysis facilities. Nuclear energy

can be used for even more specific applications, like direct propulsion of maritime ships or production of clean fuels like ammonia to decarbonize global shipping. The unique attributes of next generation nuclear energy could help accelerate decarbonization in sectors where use of renewable energy alone would be technically inefficient or excessively costly.

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the cheapest technology was to decarbonize in 2001, no one would have said wind or solar, whose prices were way too high. With strong demand-pull policies and a competitive market, both industries were able to reduce costs to become global leaders in decarbonization. Planning a new energy system around the lowest marginal cost for new low-carbon generation technology today may not produce the lowest total cost energy system in the future or help us achieve our goal of decarbonization faster.

Building an AP1000 in the U.S. today could be cost prohibitive but utilities are not looking at building them, they are looking at building next generation reactors. When looking at reactors today we should ask: how cheap do they need to be, how cheap can we make them, and how do we do it? By drawing on lessons from solar and wind, including smaller and standardized projects, business model innovation and more, we can greatly reduce the cost of future reactors so that they can work together with renewables for cost-effective decarbonization. Specific techniques like modular construction, standardization, advanced manufacturing, artificial intelligence and more can enable rapid technological learning for nuclear energy. Investment today in these technologies can enable significant future technology gains and unlock a critical, firm and complementary low-carbon energy source that helps us more efficiently and rapidly meet our clean energy goals.

Ultimately, despite large and growing amounts of nuclear energy, solar, wind and hydro power, world primary energy supply remains stubbornly carbon-intensive, above 80%. If we are to rapidly decarbonize globally over the next three decades, we need renewables and nuclear energy working together to reduce emissions as fast as possible. Arguments trying to pit nuclear energy and renewable energy against each other ignore the political opportunities of a strong and

comprehensive clean energy coalition. Markets and economics will play a central role in determining the exact energy mixes of the future. However, considering the existential stakes of climate change, advocates, innovators and governments should work together to promote all clean energy sources and reduce their costs to incentivize rapid decarbonization.

Source: <https://www.utilitydive.com/news/the-opportunity-cost-of-not-using-nuclear-energy-for-climate-mitigation/618137/>, 03 February 2022.

**OPINION – Lydia Powell, Akhilesh Sati, Vinod Kumar Tomar**

### **Nuclear Energy in India: Small may not be Beautiful**

Small modular reactors may not be as conducive for India's nuclear needs as previously envisaged. In 2004, the target set for nuclear power capacity was 20 GWe by 2020. In 2007,

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the government stated that this target could be doubled with the option of international cooperation through the 123 nuclear agreement that was to be signed with the US in 2008. In 2009, the NPCIL said that it aimed for a capacity of 60 GWe by 2032 including 40 GWe of PWRs and 7 GWe of

PHWRs (pressurised heavy water reactors) all powered by imported uranium. Projections in the draft energy policy of 2011 are more modest with 12 GW nuclear power capacity in 2022 and 34 GWe in 2040 even under the 'ambitious' scenario. In 2021, the government stated in the Parliament that nuclear power generation capacity would increase to 22,480 MWe (megawatts electric) by 2031. In 2022, nuclear power capacity stands at 6,885 MWe. Consistence under-performance of the nuclear industry in meeting capacity targets have led experts from the DAE to refer to capacity targets as aspirational.

**The nuclear power sector has the slowest**

**growth rate amongst fuels despite ambitious targets, strong protection, and generous budgetary allocations.** In 2020, nuclear energy accounted for 10 percent of global electricity generation, which is much lower than the peak of over 17.45 percent in 1996. In India, the share of nuclear generation has not exceeded 4 percent since nuclear generation began in the early 1970s. In 2002, nuclear power generation in India touched a peak of 3.7 percent of total generation which was substantial improvement from a share of about 1.8 percent in the early 1990s. In terms of capacity addition, the nuclear power sector has the slowest growth rate amongst fuels despite ambitious targets, strong protection, and generous budgetary allocations. Commentators have offered a range of reasons from huge upfront capital investment, cost escalations, technological problems to opposition from local populations to explain the slow pace of capacity addition in the nuclear sector.

Between 2002 and 2006 nuclear capacity grew by over 23 percent and by over 9 percent between 2006 and 2017 but capacity has not grown since 2017. This is in stark contrast to renewable energy (RE) capacity that started at 32 MWp (megawatt peak) in 1992 and increased to over 100,000p MW in 2021. This is not difficult to explain because unlike nuclear energy, RE enjoys the unanimous support of the global investment community and that of domestic policy makers and receives financial and non-financial incentives across the value chain. More importantly the decentralised modular nature of RE, particularly solar energy, with investments in the range of INR 40-50 million has attracted even small private sector players which in turn has contributed to the growth in RE capacity. In this context, it is not surprising that the debate over the future of nuclear power in India has shifted to reactor size, specifically over whether reactors with a

substantially smaller power output labelled SMRs are a better choice to increase the rate of capacity addition.

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**Small Modular Reactors:** Globally, there are about 50 SMR designs and concepts at different stages of development. Argentina, South Korea, China, Canada and Russia have advanced state funded programmes with operational plants. Private companies often with state assistance based in industrialised countries including the USA, and the UK are also in the race to commercialise SMRs. Reactors that dominate the SMR experiment today

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are PWRs, the predominant nuclear technology deployed today. The long record of operation and the licensing experience, SMRs based on PWR technology have a substantial head start. As the components of PWR technology based SMRs are like those in larger reactors, the licensing process is expected to be straight forward for developers. There are SMR initiatives that are experimenting on old technologies that were not actively considered after the 1970s. These include pebble-bed reactors and molten salt reactors. Other SMR concepts focus on the nuclear waste problem by trying to burn or transmute various isotopes in spent fuel. Yet another SMR concept is a nuclear battery or fuel for a lifetime that would not require onsite refuelling throughout its commercial life.

**Economics of Small Reactors:** A nuclear reactor is qualified as "small," when its capacity is less than 300 MWe which is about one-third the capacity of a standard nuclear reactor. The choice of a cluster of SMRs over one large

reactor involves two competing economic principles: economies of scale and economies of mass production. Building five SMRs of 200 MW capacity will cost more than building one 1,000 MW nuclear reactor. But this loss in economies of scale is expected to be made up in economies of mass production. The argument is that if there is demand for several SMRs, unit cost will be reduced contributing to an overall reduction in cost of building nuclear reactors. India's nuclear industry which consists mostly of small reactors challenges this assumption.

The assumption that additional costs incurred by SMRs can be offset through economies of mass production remains to be tested because as of 2022, there are no mass orders for SMRs.

Out of India's 23 nuclear power reactors, 18 have a capacity of less than 300 MWe which means that most are "small" reactors. The small size of India's nuclear reactors has meant that India's total nuclear power capacity is low compared to the number of nuclear power reactors. For example, the 10 largest nuclear islands of China consist of 43 nuclear reactors with total capacity of 45.6 GWe. All the reactors in these nuclear islands have capacity of 1,000 MWe barring the oldest reactor that has a capacity of 600 MWe. With double the number of reactors compared to India, China has more than six times the nuclear capacity of India.

A better example is South Korea. It has 24

nuclear power reactors, just one more than that of India, but the total nuclear power capacity of South Korea is 23.15 GWe, more than three times that of India. India's small reactors has not necessarily meant lower costs, nor has it meant fewer experts employed per reactor. It has in fact reduced the contribution of the nuclear sector to overall power generation and consequently not contributed substantially to reduce carbon dioxide emissions. It also increased the tariff for nuclear power as costs could be spread over larger

capacity. The assumption that additional costs incurred by SMRs can be offset through economies of mass production remains to be tested because as of 2022, there are no mass orders for SMRs. Though Westinghouse's AP 1,000 reactors made in USA and China were based on the concept of modular construction they have had huge cost overruns and schedule delays. Even if the SMR concept does take off and supply chains for modular construction of SMRs are established, they are likely to be based outside India. This would mean import of SMRs which would mean higher cost and outgo of foreign exchange.

Other Challenges: SMRs are expected to reduce the long lead times for nuclear power plant construction but new features introduced in SMRs may initially increase time required for licencing. SMRs are promoted as a complement to RE-based power generation but this goes against the logic of nuclear power generation. Nuclear power generation has high fixed costs

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and low variable cost, which makes nuclear power suitable for baseload power generation at reasonable tariff. Responding to RE variability would mean operating at partial loads which will increase cost and potentially lead to technical risks. For example, if SMRs are operated at low power during the day when solar power generation is available and increased in the evening when solar generation falls, the result will be wide temperature difference (from 450°C to 1,600°C) between the two modes of operation. This could potentially lead to crack formation in uranium oxide fuel leading to rupture of the cladding surrounding the fuel and eventual leakage of fission products. This would put the reactor in the dangerous zone.

**Nuclear power generation has high fixed costs and low variable cost, which makes nuclear power suitable for baseload power generation at reasonable tariff. Since the 1950s when nuclear power generation was established, the size of the reactors has increased from 60 MWe to more than 1,600 MWe, with corresponding economies of scale in operation.**

**Nuclear power generation has high fixed costs and low variable cost, which makes nuclear power suitable for baseload power generation at reasonable tariff.** Since the 1950s when nuclear power generation was established, the size of the reactors has increased from 60 MWe to more than 1,600 MWe, with corresponding economies of scale in operation. Competition from RE has pushed the nuclear industry to reverse this trend to become as small and as nimble as RE. Enormous expertise in the engineering of small power units built for naval use (up to 190 MW thermal) and as neutron sources can assist the nuclear industry in producing SMRs that strike the right balance between economies of scale and economies of mass production. But until then, the 700 MWe PHWR that is mostly

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indigenous, safe, and reasonably economic to build and operate is the bird in the hand for the Indian nuclear industry compared to many SMRs that are still in the bush.

Source: <https://www.orfonline.org/expert-speak/nuclear-energy-in-india/>, 03 February 2022.

**OPINION – Timothy Wright, Hugo Decis**

**Assessing India's Nascent Nuclear Triad**

With tensions rising in the Indo-Pacific, India is making progress in developing its nuclear triad. Ongoing developments and acquisitions should help improve the capabilities and credibility of India's nuclear forces. India's incipient nuclear triad has been bolstered by recent events, some well publicised by New Delhi, others less so.

After more than a decade since development began, the *Agni-VICBM* had its first user trial conducted by India's Strategic Forces Command on 27 October 2021. The test was announced by the Ministry of Defence. Less heralded was the apparent launch in late November of India's third nuclear-powered ballistic missile submarine (SSBN), which is currently sitting in the water at the Naval Dockyard in Visakhapatnam. These events have occurred against the backdrop of growing tensions between India and China.

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fall weapons, land-based ballistic missiles and, more recently, the beginnings of an SSBN capability.

**Range Matters:** Developed by the DRDO, the *Agni-V* was first tested in 2012, with at least eight subsequent trial launches carried out to date, including the one in October 2021. The DRDO implicitly continues to describe the *Agni-V* IRBM, rather than as an ICBM, by claiming the system has a range of 5,000 kilometres, which is toward the upper limit of IRBM performance. Its suspected reach likely exceeds 5,500 km, the minimum range for an ICBM. More importantly, at least from New Delhi's perspective, if deployed to basing options in southern India that are beyond the range of Chinese MRBMs and IRBMs which can strike targets in northern parts of India, the *Agni-V* places targets across China within reach. The DRDO is also drawing on guidance and propulsion technology from the *Agni-V* as part of the recapitalisation of India's MRBM inventory. A second test firing of the two-stage solid-fuel *Agni-P* was conducted on 18 December 2021. The DRDO has said it plans to replace India's older *Agni-I* and *-II* short-range ballistic missiles with the newer system, which the DRDO has described as being 'nuclear capable' and highly accurate. The IISS estimates that India has 12 *Agni-I* and eight *Agni-II* launchers in service.

**Beneath the Surface:** The sea-based leg of India's triad is progressing, though New Delhi has so far been more reticent to discuss or disclose any details about this programme. Satellite imagery of what is likely the third SSBN has shown it

berthed at the Visakhapatnam Naval Dockyard. While the Indian Navy has made no announcement regarding the unnamed hull, its length, estimated to be more than 120 metres, suggests it is an SSBN, as does the raised missile compartment to the rear of the sail. Notably, the latest hull is longer than those of the first two *Arihant*-class boats, which may well indicate the third *Arihant* class is being built with a larger missile compartment. Whereas the first two submarines, *INS Arihant* and *INS Arighat*, have a four-tube configuration, the latest hull may have an eight-tube compartment.

**It is believed that Arihant and Arighat are able to carry up to 12 K-15 short-range SLBM. These are the first SLBMs developed by India. Given their comparatively small size, three K-15s can be accommodated in each missile launch tube. However, the K-15's utility is limited by its 700 km range, which means, in a conflict with Pakistan, it would be confined to targets in the south of the country.**

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**Despite ongoing development and acquisition, India's nuclear doctrine is based on what it views as a credible minimum deterrent and a no first-use policy. Its emphasis on fielding a triad likely reflects New Delhi's perceptions of, and the need to respond to, Chinese and, to a lesser extent, Pakistani nuclear developments. It also reflects rising tensions in the Indo-Pacific region.**

According to the DRDO, the K-4 is intended to have a 3,500 km range. Were the third *Arihant* class and any follow-on boats of this class to have eight launch tubes, combined with the eventual introduction of the K-4, this would increase the credibility of the sea-based leg of India's deterrent forces. Despite ongoing development and acquisition, India's nuclear doctrine is based on what it views as a credible minimum deterrent and a no first-use policy. Its



emphasis on fielding a triad likely reflects New Delhi's perceptions of, and the need to respond to, Chinese and, to a lesser extent, Pakistani nuclear developments. It also reflects rising tensions in the Indo-Pacific region.

Source: <https://www.iiss.org/blogs/military-balance/2022/01/assessing-indias-nascent-nuclear-triad?s=08>, 28 January 2022.

**OPINION – Joseph Detrani**

**North Korea is Using Time to Perfect its Nuclear and Missile Programs**

The six missiles North Korea launched in January was a statement — and proof — that North Korea is upgrading its arsenal of missiles to deliver nuclear weapons. North quietly builds more nuclear weapons based on plutonium and highly enriched uranium. It publicly displayed its progress in January with hypersonic and cruise missiles and short-range ballistic missiles launched from rail cars. Indeed, North Korea's advances with hypersonic missiles were demonstrated with the Jan. 11 hypersonic missile that flew 1000 kilometers at 10 times the speed of sound and reportedly successfully hit its target. A hypersonic missile that can cover vast distances in minutes, flying low and nimbly manoeuvring, is challenging for any missile defense system.

Efforts of the UNSC to sanction North Korea for its January missile launches — which violated resolutions prohibiting the testing of ballistic missiles — were unsuccessful when China and Russia blocked the passage of the sanctions. North Korea may now believe that despite UNSC resolutions, it can move forward and conduct additional nuclear tests and missile launches with impunity, knowing China and Russia will block any effort to impose sanctions on them. This would be unfortunate and very dangerous.

Kim Jong-un made it clear one year ago, at the 8th Congress of the Workers Party, that North Korea would enhance its nuclear and missile capabilities, clearly stating that the focus would be on

hypersonic missiles, submarine-launched ballistic missiles, tactical nuclear weapons and mobile, solid-fuel intercontinental ballistic missiles. One year later, despite the country's dire economic situation, due to the coronavirus, a closed border and biting sanctions, Mr. Kim has moved forward with his hypersonic, cruise missile and SLBM programs. And now that it appears the border with China has opened slightly, trade will resume. Despite UNSC resolutions, North Korea will get additional crude oil shipments from China to sustain its economy.

In short, if there are no consequences, it's fair to assume that North Korea will move forward with its ICBM program. In 2017, the North launched two ICBMs — the Hwasong-14 and 15 — both theoretically capable of reaching the United States.

On Oct. 10, 2020, North Korea, on the 75th anniversary of the founding of the Workers' Party, displayed what would be the largest road-mobile ICBM in the world. It's possible — and some say likely — that North Korea

will launch an ICBM soon, in line with Mr. Kim's pronouncement to advance his country's nuclear and missile capabilities. Such a launch will get the international community's attention and certainly the United States. At a Politburo meeting of the Workers' Party in January, Mr. Kim reportedly said North Korea would consider restarting "all temporarily-suspended" activities, implying launches of ICBMs and nuclear tests.

In 2017, we witnessed something similar to what we're beginning to now see. North Korea had conducted its sixth nuclear test, assessed to have been a thermonuclear test. It launched two ICBMs — the Hwasong 14 and 15 — and the vitriol coming from Pyongyang was offensive. Former President Donald Trump responded with "fire and fury," conducting and enhancing joint military exercises with South Korea and imposing crushing sanctions, supported by China and Russia. Tension was defused when Mr. Kim proffered an invitation, passed through South Korea, to meet personally with Mr. Trump. The invitation was accepted, and

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the June 2018 Singapore Summit was convened, with an upbeat joint statement, followed by a February 2019 Hanoi Summit that ended in failure. Since then, negotiations with North Korea have ceased, and while the North continues to produce fissile material for nuclear weapons and continues to upgrade its missile capabilities, the North has refrained from conducting another nuclear test or launching another ICBM. This may now change.

China has considerable leverage over North Korea. Over 90% of trade is with China, and over 90% of crude oil comes from China. It wouldn't be too much of an exaggeration to say that North Korea's economy is dependent on China. Given that leverage, China could and should try to convince Mr. Kim that resuming nuclear tests and ICBM launches would be inimical to North Korea's interest. In fact, telling Mr. Kim that China would support sanctions, as it did in 2017, if North Korea escalated tension by conducting nuclear and ICBM tests would have an impact. There is reason to believe Mr. Kim would listen and comply with China's request if this message came directly from President Xi Jinping.

As was done during the Six-Party Talks with North Korea before the Sept. 19, 2005, joint statement that committed North Korea to dismantle all nuclear weapons and facilities in return for sanctions relief, economic development assistance and a path to normal relations, the five countries — the United States, South Korea, Japan, China and Russia — would occasionally meet or share views when North Korea was escalating or threatening to escalate tension. This would be a perfect time for these five countries, ideally with seniors from

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the State Department and the Ministries of Foreign Affairs, to meet, strategize and work together to get North Korea to refrain from any further escalation of tension and return to negotiations. Such an initiative by these five countries could prove productive. It certainly would have broad

international support.

Source: [https://www.thecipherbrief.com/column\\_article/north-korea-is-using-time-to-perfect-its-nuclear-and-missile-programs](https://www.thecipherbrief.com/column_article/north-korea-is-using-time-to-perfect-its-nuclear-and-missile-programs), 02 February 2022.

#### OPINION – Ariel Cohen

### The Future of Western Energy Investments in Kazakhstan

On January 2, mass protests erupted in Kazakhstan over removing price caps on liquefied petroleum gas (LPG) leading to a 100% spike in fuel costs. It was the beginning of the worst political earthquake the young Eurasian country has seen since its founding in 1991. Peaceful demonstrations quickly morphed into violent political protests – the worst the country has seen in its 30 years of nationhood. Approximately 225

people were killed, and up to 5,000 were arrested in the ensuing crisis, though that number has since dropped to 2,500.

Kazakhstan is an oil and natural resource-rich country and consequently the destination for a great deal of energy and other investment. Western companies with an economic interest in Kazakhstan such, as

Chevron and Exxon Mobil, are now assessing the security of their investments. For now, things seem stable. Over the last 30 years, Kazakhstan has built a robust relationship with western investors.

**Over the last 30 years, Kazakhstan has built a robust relationship with western investors. In 2020 alone, the Netherlands was the country's largest source of foreign direct investment (5.1 billion USD, 30.1%), followed by the US (2.24 billion USD, 13.12%), Switzerland (1.7 billion USD, 10.4%), the Russian Federation (1.2 billion USD, 7.09%), China (0.96 billion USD, 5.62%) and the UK (0.85 billion USD, 5%).**

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As of 2022, some 600 US companies are operating in the region with an average of \$45 billion in investments. On top of that, Kazakhstan's cumulative energy investment from 2005 to 2020 was \$161 billion, of which \$30 billion came directly from the US. This demonstrates the unique economic partnership between the two nations. The US-Kazakh energy relationship is vital as China with its (BRI, and Russia with its iron ore investments are looking to expand influence in the region. Kazakhstan produces around 2% of the oil that the world consumes daily and makes up 8% of Europe's oil import supplies.

Kazakhstan also represents 40% of the world's uranium production. With French nuclear companies such as Orano sourcing directly from the country, this investment remains stable. Europe has been steadily moving toward green and sustainable – with nuclear power and small modular reactors now under the “green” label. Sustaining uranium production out of Kazakhstan remains essential to Europe's energy security and is likely to grow. These are impressive achievements, which made Kazakhstan the economic leader of Eurasia with an annual per capita income of \$11,500 – higher than Russia's.

The protests were triggered by acute income inequality, aggravated by the involvement of criminal elements and possibly some Islamists. Scenes of looting and killing shocked the locals and the expats alike. They brought an abrupt political change in Kazakhstan with the resignation of most of the government. Amidst the unrest, former President Nursultan Nazarbayev,

who had been Security Council Chairman and been in power since the late 1980s, was quickly replaced by his successor President Kassym-Jomart Tokayev, who took over the riot suppression job. However, it appears that the changes and the unrest did not directly impact energy corporations in the region or the larger market.

Chevron, alongside Exxon Mobil, operates and owns 75% of the giant Tengiz oil field project, only noted a one-day partial shutdown that resulted in a 6% reduction of production. As of the end of January, the oil fields are fully operational. This means the impact of the protests was minimal, after a short-term increase in oil and uranium prices that have since stabilized.

The Kazakh government has always recognized the importance of outside investors. President Tokayev has paid particular attention to ensuring that both domestic and foreign investors are favoured in the forthcoming reforms – stating, “Kazakhstan remains consistently open to multifaceted cooperation with the international community.”

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He further confirmed that any new investment policy would honour previous contracts and investments. It is in the interest of western investors and the Kazakh government to ensure that these investments are protected transparently. Western energy companies are often more transparent than some local businesses, are the most significant contributors to the country's budget, and are vital to its economic stability. Investors are eager to hear detailed plans on the reforms that will be taking place in the coming months. President Tokayev pledged to launch structural changes following emergency measures designed to alleviate social and economic inequality – something investors will need to consider moving forward. ...

Overall, western companies are keeping a watchful eye on their investments, though it

seems that continued financial flows paint a picture of confidence in Kazakhstan's stability. In the longer term, support of the market reforms and social stability by Western companies and governments will play a key role in the country's economic success.

Source: <https://www.forbes.com/sites/arielcohen/2022/02/07/the-future-of-western-energy-investments-in-kazakhstan/?sh=562026ac54b4>, 07 February 2022.

**OPINION – Nicholas Wtason**

**Digital Tools, Virtual Reality and Robots to Help in Accelerating Dismantling of Retired Nuclear Facilities, IAEA Survey Shows**

Operators and authorities in more and more countries are moving to immediately dismantle their retired nuclear facilities, and emerging digital technologies coupled with greater usage of robots and drones are offering significant potential for more effective project implementation and risk reduction, an IAEA survey on the global status of nuclear decommissioning has found.

Decommissioning activities including the use of cutting-edge technologies are set to ramp up in the coming years as several of the world's 439 nuclear power reactors are phased out of operation. The conclusions of a 30-month IAEA project, discussed during a recent webinar, will provide additional insights for policymakers and other stakeholders interested in the future management of retired nuclear facilities.

"Previously, many programmes elected to defer dismantlement of retired facilities, but immediate dismantling is now becoming the predominant decommissioning strategy worldwide," said Olena Mykolaichuk, Head of the IAEA's

Decommissioning and Environmental Remediation Section. "And our survey can help countries to keep abreast of important technical developments in this area."

Decommissioning includes decontamination and dismantling of plant and building structures, leading to the removal of regulatory controls, so that a facility and site may be reused. It is a complex endeavour, requiring timely and effective management – skills and expertise that are crucial to further develop. Globally, 199 power reactors have been shut down for decommissioning, with 21 fully decommissioned. In addition, 130 fuel cycle facilities have been decommissioned as well as about 450 research reactors.

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To improve understanding of the current status and future evolution of decommissioning activities, the IAEA sent out a Global Decommissioning Strategy questionnaire to more than 50 countries and evaluated the responses alongside data from the IAEA's Power Reactor Information System (PRIS), Research Reactor Data base (RRDB) and Integrated Nuclear Fuel Cycle Information System (INFCIS). At the same time, the IAEA hosted a series of

technical meetings over three years that brought together dozens of experts from some 20 countries as well as the Nuclear Energy Agency of the OECD and the European Commission to share experiences and provide feedback.

While existing decommissioning technologies are mostly proving sufficient to the task at hand, the report showed that countries are increasingly looking at high-tech solutions to meet unique challenges and stand to benefit from further technological innovation to help reduce risks, enhance safety and cut schedules and costs.

Countries managing accident sites such as Japan are using innovative robotic technology and

remote inspection tools to locate and characterize fuel debris as part of efforts to retrieve and dispose of this material. Technologies such as 3D modelling or building information modelling (BIM), virtual reality and remotely controlled technologies, including drones and robots, are also being applied increasingly to the decommissioning of facilities that have reached the end of normal life. These technologies enable more efficient collection, understanding, display and management of data, allowing different scenarios to be visualized during planning and preparation of dismantling and decontamination activities.

“Coupling BIM with GPS or location-aware Wi-Fi networks enables the deployment of semi or fully autonomous robotics systems and drones,” said Hannes Hanggi of the Swiss Federal Nuclear Safety Inspectorate, who helped lead the IAEA project. “They have the potential to significantly lower costs, further increase safety and enhance performance in decommissioning projects.”

Decommissioning strategies are informed by factors such as national policy, the availability of waste management systems and other enabling infrastructure as well as technological innovation and political and societal thinking on environmental issues such as sustainability and circular economy. There is also a move towards earlier decommissioning licensing and a reduction of the time delay between final shutdown and the start of dismantling. One-fifth of the responses obtained from nuclear power plants envisaged that dismantling would proceed while spent fuel remained in the reactor or in the spent fuel pool.

The survey also analysed factors negatively impacting on the delivery of projects. Among them, the availability of waste facilities and funding had the biggest impact while end-state and future-use options had the smallest. Most

nuclear power plants are required to have a mechanism in place to ensure that sufficient funds will exist to pay for decommissioning. Such funds are typically built up through fractional charges in bills to ratepayers and set aside by electricity generators during the period of operation.

Significant financial resources have already been utilised globally to decommission nuclear power plants, research reactors and fuel cycle facilities, and significantly greater resources are expected to be needed for future activities over a period of several decades as ageing facilities are retired, said Simon Carroll, Senior Advisor on Nuclear Decommissioning at Vattenfall, Sweden. “By the same token, human resource requirements for future decommissioning will be significantly larger than the level of resources already used,” Carroll added. “Simply put, the industry will need a lot more people and experts in this field.”

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To attract new talent, the IAEA in 2020 held a global crowdsourcing challenge that sought original concepts or project outlines from young people for advancing the decommissioning of nuclear facilities or environmental remediation of radiologically contaminated sites. Entries included characterization toolkits, instruments for on field measurements and collecting 3D radiation data, as well as robots and artificial intelligence.

The IAEA assists countries in efforts to plan and implement decommissioning projects and develops related safety standards and Nuclear Energy Series publications and other reports on technical and safety related aspects, organizes meetings of experts, collaborative projects, scientific exchanges, peer reviews, training courses and workshops. These activities are supported by resources including an eLearning platform and the International Decommissioning Network (IDN), which provides a forum for interaction among experts who can also share knowledge via a wiki-based information resource. The Agency pays particular attention to

introducing circular economy principles into decommissioning considerations.

Source: <https://www.iaea.org/newscenter/news/digital-tools-virtual-reality-and-robots-to-help-in-accelerating-dismantling-of-retired-nuclear-facilities-iaea-survey-shows>, 01 February 2022.

## **NUCLEAR STRATEGY**

### **RUSSIA**

#### **US Believes Russia Plans Nuclear Exercise to Warn West over Ukraine**

US military and intelligence officials believe that Russia is planning to hold a big nuclear weapons exercise this month as a warning to Nato not to intervene if President Vladimir Putin decides to invade Ukraine. General Mark Milley, chair of the joint chiefs, and Avril Haines, director of national intelligence, told lawmakers in the House of Representatives that Putin was planning to start the exercises in mid-February, according to a Congressional aide with knowledge of the closed-door briefing.

Russia generally holds its annual nuclear exercises — which involve testing intercontinental ballistic missiles from land, sea and air — in the fall. But the US believes Putin has decided to hold them earlier this year as a show of strength in the event that he orders his military to further invade Ukraine. The US believes that the optimum time for a Russian invasion would be from mid-February to the end of March.

Holding the exercises to coincide with an invasion would send a powerful reminder to Nato about

the strength of Moscow's nuclear forces, which are the largest in the world. Russia has just under 4,500 nuclear warheads in its stockpile, according to the Federation of American Scientists. "It would be an incredibly provocative and foreboding message if they did that simultaneously with an invasion of Ukraine," said Rebecca Heinrichs, a nuclear weapons policy expert at the Hudson Institute in Washington.

The US has not determined if Putin has decided to invade Ukraine. But with its allies, Washington is increasingly alarmed by the continuing military build-up of Russian forces around the border with

Ukraine. In the past two weeks, Russia has increased the number of battalion tactical groups — which can range from 750 to 1,000 troops — deployed in the border region from 60 to 83, according to one Nato source. Another 14 BTGs are also in transit to the border area. The US believes Russia has also deployed between 1,200 and 2,100 special operations troops in the region.

The new battalion tactical groups and other troops deployed in the area bring the total number of Russian forces in the region to well over 100,000. Washington estimates that Russia has deployed enough forces for a limited attack but has only positioned 70 per cent of the troops that it would need for a full-scale invasion, which would include an assault on Kyiv, the Ukrainian capital.

US military experts believe Russia has the capability to deploy enough forces for a full invasion by the middle of February, which would coincide with the expected start of its nuclear weapons exercises. Earlier, President Joe Biden ordered the deployment of 2,000 US troops to Poland and Germany, in an effort to send a signal

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to Putin about the strength of the Nato alliance. ... The US accused Russia of preparing to fabricate an attack by Ukraine or the west, in a "false flag" operation designed to create a pretext for an invasion.

...Putin accused the US of trying to "drag" Russia into armed conflict and said it was ignoring Russia's security concerns and its demand for a guarantee that Nato would not admit Ukraine in the future. The Russian leader received support from Chinese president Xi Jinping when he visited Beijing for the opening of the Winter Olympics. In a joint statement, they said they "oppose further enlargement of Nato".

A senior US official said China should have used the meeting with Putin to encourage him to de-escalate in Ukraine. "If Russia further invades Ukraine and China looks the other way, it suggests that China is willing to tolerate or tacitly support Russia's efforts to coerce Ukraine even when they embarrass Beijing, harm European security, and risk global peace and economic stability" he said.

Source: <https://www.ft.com/content/a2e0340c-fe7b-4d89-aea5-e07ff84b20fb>, 05 February 2022.

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statement. "BDL has increased its production capacity to meet Konkurs-M's domestic and foreign demand. As part of its global reach, BDL also offers man-portable anti-tank guided missiles, Nag, Milan2T, and Amogha, in addition to Konkurs-M, for export," he said.

Konkurs-M is manufactured by BDL under a license agreement with a Russian OEM (Original Equipment Manufacturer). The missile has been indigenized to the maximum. BDL also offers Konkurs-M missiles for export to foreign friends, he said. Konkurs-M is a second-generation mechanized infantry-guided anti-tank missile for the destruction of armored vehicles equipped with explosive reaction armor. The missile can be launched from both the BMPII tank and the ground launcher. It has a range of between 75 and 4,000 meters with a flight time of 19 seconds. technology with foreign OEMs "overseas," the statement said. Shares of BDL closed down 0.92% at Rs 487.40 on BSE.

Source: <https://defenceaviationpost.com/indian-army-to-get-made-india-india-konkurs-m-anti-tank-guided-missiles/>, 03 February 2022.

**BALLISTIC MISSILE DEFENCE**

**INDIA**

**Indian Army to Get Made-India-India Konkurs-M Anti-Tank Guided Missiles**

Bharat Dynamics Ltd (BDL) announced on 09 February that it has signed a contract worth Rs 3,131.82 crore with the Indian Army for the production and supply of Konkurs-M anti-tank guided missiles. The contract will be executed over the next three years. With this order, BDL's backlog stands at Rs 11,400 crore, the company said in a

**Konkurs-M is a second-generation mechanized infantry-guided anti-tank missile for the destruction of armored vehicles equipped with explosive reaction armor. The missile can be launched from both the BMPII tank and the ground launcher. It has a range of between 75 and 4,000 meters with a flight time of 19 seconds. technology with foreign OEMs "overseas," the statement said.**

**ISRAEL**

**Israel to Operate Laser-Based Defence System within Year**

Israeli Prime Minister, Naftali Bennett, said on 01 February that the nation's army will deploy a laser air defence system to intercept drones, missiles and UAVs within one year, *Anadolu News Agency* reports. Bennett made the announcement

in an address at the annual international conference of the Institute for National Security Studies (INSS), according to the official

Israeli *KAN* news channel. He said the new system will be deployed first in the south to tackle rocket attacks from the Gaza Strip and the technology will be offered to Israel's friends in the region against what he said are threats from Iran and its proxies.

The Israeli Defence Ministry said, in January 2020, that it developed a laser interception system against rockets after decades of failed attempts. Israel currently possesses a variety of short, medium- and long-range air defence systems, including the Iron Dome, designed to shoot down short-range rockets and drones; the Arrow system, which intercepts ballistic missiles outside of the Earth's atmosphere and the David's Sling missile defence system that is designed to intercept tactical ballistic missiles.

Source: <https://www.middleeastmonitor.com/20220202-israel-to-operate-laser-based-defence-system-within-year/>, 02 February 2022.

### **SAUDI ARABIA-UAE-USA**

#### **Twin FMS Deals Support Ballistic Missile Defence in Saudi Arabia and UAE**

Saudi Arabia and the UAE are requesting missile defence equipment from the US under the FMS programme. The State Department has approved two potential FMS deals to help US allies in the Middle East enhance and maintain their ballistic missile defence systems, on the same day that it gave the green light to a \$4.21 billion FMS package for Jordan.

Saudi Arabia is requesting 31 units of the Multifunctional Information Distribution System-Low Volume Terminals (MIDS-LVT) Block Upgrade 2 (BU2) and related equipment for an estimated cost of \$23.7 million, to operate with the THAAD system. Data Link Solutions

manufactures MIDS-LVT BU2 but a prime contractor for the Saudi FMS will only be confirmed once a Letter of Acceptance is signed, the State Department noted on 3 February. 'The

proposed sale will provide the Saudi armed forces with the equipment, training, and follow-on support necessary to 'protect Saudi Arabia, and the region, from the destabilising effects of terrorism, countering Iranian influence, and other threats', the State Department noted on 3 February. The BU2 terminals would be added to

a previous \$3 million FMS case for MIDS-LVT Block Upgrade 1 (BU1) terminals. Previously provided BU1 terminals for Saudi Arabia were installed on Patriot batteries.

Similarly, the State Department has also approved an extra \$35 million on top of a previous \$30 million FMS deal to fund common spares and repair parts for UAE-operated MIM-23 Homing All the Way Killer (HAWK) SAM missile, Patriot and

THAAD systems. 'The amended FMS case would extend the funding to cover an additional three years,' the State Department noted. It added that the revised FMS order aligns with US Central Command (CENTCOM) planning and would support existing

capabilities in the UAE to 'deter and defend against hostile threats' by maintaining the operational readiness of critical air defence systems. Saudi Arabia and the UAE have each suffered repeated missile and UAV attacks from Iran-backed Houthi rebels in Yemen. Most recently, on 31 January, the UAE said it intercepted a ballistic missile fired from Yemen.

Source: <https://www.shephardmedia.com/news/defence-notes/twin-fms-deals-support-ballistic-missile-defence-i/>, 04 February 2022.

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**NUCLEAR ENERGY**

**EU**

**EU Proposes Rules to Label Some Gas and Nuclear Investments as Green**

Investments in some gas and nuclear power plants would be labelled as sustainable under rules proposed by European Commission on 02 February, a plan that has split countries and investors, and which some lawmakers will attempt to block. Brussels has taken more than a year to decide if gas and nuclear energy should count as green investments in the EU's taxonomy, an investor rulebook designed to help raise massive amounts of private capital to meet EU climate change targets. In final rules published on 02 February 2022, gas power plants would be labelled green this decade if they emit less than 270g of CO2 equivalent per kWh, or have annual emissions below 550kg CO2e per kW over 20 years. That could include gas plants with relatively high CO2 emissions today, provided they switch to low-carbon gas or reduce their running hours in later years.

Gas plants must switch to run on low-carbon gases by 2035. A requirement in a previous draft, for plants to start switching in 2026, was dropped. New nuclear plants must receive construction permits before 2045 to get a green investment label, and be located in a country with a plan and funds to safely dispose of radioactive waste by 2050. "We're setting out how gas and nuclear could make a contribution in the difficult transition to climate neutrality," EU financial services chief Mairead McGuinness said. "We're putting in place strict conditions for their inclusion in the taxonomy."

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**Denmark, Ireland and others say labelling the fossil fuel as green would undermine the EU's leadership in fighting climate change. If approved, the gas and nuclear rules would apply from Jan. 2023, when providers of financial products must disclose what share of their investments comply. The taxonomy does not oblige investors to make "sustainable" investments - rather, it limits which ones can be marketed as such.**

The rules, which arrive as Europe grapples with surging energy prices and concerns about its reliance on imported Russian gas amid political tensions over Ukraine, have faced opposition on multiple fronts, including from campaigners, the EU's expert advisers, some investors and countries. That debate reflects broader divisions among governments over the path to meet the EU's goal of net zero emissions by 2050.

EU countries and the European Parliament have four months to potentially block the rules, which could be done by a super-majority of 20 out of the 27 EU countries - a threshold seen as unlikely - or a majority of lawmakers.

Green EU lawmakers said they would campaign for the 353 votes needed to block the proposal, and already had roughly 250. "There is still a chance to stop this," German Green lawmaker Michael Bloss said. The Austrian government on 02 February repeated its threat to take legal action over nuclear's green label.

While opponents cite concerns over nuclear waste disposal, pro-nuclear states including France say the CO2-free energy source is crucial to meet climate targets. Gas is similarly divisive, with Poland and Bulgaria among the states that say gas investments should be encouraged to phase out more-polluting coal. Denmark, Ireland and others say labelling the fossil fuel as green would undermine the EU's leadership in fighting climate change. If approved, the gas and nuclear rules would apply from Jan. 2023, when providers of financial products must disclose what share of their investments comply. The taxonomy does not oblige investors to make "sustainable" investments - rather, it limits which ones can be

marketed as such.

Source: Kate Abnett, [https://www.zawya.com/mena/en/story/EU\\_proposes\\_rules\\_to\\_label\\_some\\_gas\\_and\\_nuclear\\_investments\\_as\\_green-TR20220202nL8N2 UD3JNX1/](https://www.zawya.com/mena/en/story/EU_proposes_rules_to_label_some_gas_and_nuclear_investments_as_green-TR20220202nL8N2 UD3JNX1/), 02 February 2022.

**EU Taxonomy: Commission presents Complementary Climate Delegated Act to Accelerate Decarbonisation**

The European Commission...presented a Taxonomy Complementary Climate Delegated Act on climate change mitigation and adaptation covering certain gas and nuclear activities. The College of Commissioners reached a political agreement on the text, which will be formally adopted once translations are available in all EU languages.

A great deal of private investment is needed for the EU to become climate neutral by 2050. The EU Taxonomy aims to guide private investment to activities that are needed to achieve climate neutrality. The Taxonomy classification does not determine whether a certain technology will or will not be part of Member State energy mixes. The objective is to step up the transition, by drawing on all possible solutions to help us reach our climate goals. Taking account of scientific advice and current technological progress, the Commission considers that there is a role for private investment in gas and nuclear activities in the transition. The gas and nuclear activities selected are in line with the EU's climate and environmental objectives and will allow us to accelerate the shift from more polluting activities, such as coal generation, towards a climate-neutral future, mostly based on renewable energy sources. In particular....

**Complementary Climate Delegated Act:**

**- Introduces additional economic activities from the energy sector into the EU Taxonomy.** The text sets out clear and strict conditions, under Article

10(2) of the Taxonomy Regulation, subject to which certain nuclear and gas activities can be added as transitional activities to those already covered by the first Delegated Act on climate mitigation and adaptation, applicable since 1 January 2022. These stringent conditions are: for both gas and nuclear, that they contribute to the transition to climate neutrality; for nuclear, that it fulfils nuclear and environmental safety requirements; and for gas, that it contributes to the transition from coal to renewables. More specific additional conditions apply for all the above activities and are specified in today's Complementary Delegated Act.

**- Introduces specific disclosure requirements for businesses related to their activities in the gas and nuclear energy sectors.** To ensure transparency, the Commission has today amended the Taxonomy Disclosures Delegated Act, so that investors can identify which investment

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opportunities include gas or nuclear activities and make informed choices. The text of the Complementary Delegated Act follows expert consultations with the Member States Expert Group on Sustainable Finance, and the Platform on Sustainable Finance. The Commission has also listened to feedback from the European Parliament on the matter. The Commission has carefully examined the

input received from those groups and took it into consideration in the text presented today. For instance, as a result of the feedback, targeted adjustments to the technical screening criteria and disclosure and verification requirements were introduced to reinforce their clarity and usability.

**Members of the College said:** Valdis Dombrovskis, Executive Vice-President for an Economy that Works for People, said: "Our mission and obligation is climate neutrality. We need to act now if we are to meet our 2030 and 2050 targets. Today's Delegated Act is about accompanying the EU economy in the energy transition, a just transition, as a bridge towards

a green energy system based on renewable energy sources. It will accelerate the private investment we need, especially in this decade. With today's new rules, we are also strengthening transparency and disclosures of information, so that investors make informed decisions, thereby avoiding any greenwashing."

**Mairead McGuinness**, Commissioner in charge of Financial Services, Financial Stability, and Capital Markets Union, said: "The EU is committed to achieving climate neutrality by 2050 and we need to use all the tools at our disposal to get there. Stepping up private investment in the transition is key to reaching our climate goals. Today we are setting out strict conditions to help mobilise finance to support this transition, away from more harmful energy sources like coal. And we are boosting market transparency so that investors will be able to easily identify gas and nuclear activities in any investment decisions."

**Next Steps:** Once translated into all official EU languages, the Complementary Delegated Act will be formally transmitted to the co-legislators for their scrutiny. As for the other Delegated Acts under the Taxonomy Regulation, the European Parliament and the Council (who have delegated the power to the Commission to adopt Delegated Acts under the Taxonomy Regulation) will have four months to scrutinise the document, and, should they find it necessary, to object to it. Both institutions may request an additional two months of scrutiny time. The Council will have the right to object to it by reinforced qualified majority, which means that at least 72% of Member States (i.e. at least 20 Member States) representing at

**As for the other Delegated Acts under the Taxonomy Regulation, the European Parliament and the Council (who have delegated the power to the Commission to adopt Delegated Acts under the Taxonomy Regulation) will have four months to scrutinise the document, and, should they find it necessary, to object to it. Both institutions may request an additional two months of scrutiny time.**

least 65% of the EU population are needed to object to the Delegated Act. The European Parliament can object by a majority of its members voting against in plenary (i.e. at least 353 MEPs).

Once the scrutiny period is over and if neither of the co-legislators objects, the Complementary Delegated Act will enter into force and apply as of 1 January 2023.

**Background:** The European Green Deal is Europe's growth strategy that aims to improve the well-being and health of citizens, make Europe climate-neutral by 2050 and protect, conserve

and enhance the EU's natural capital and biodiversity. The aim of the EU Taxonomy is to help improve the flow of money towards sustainable activities across the European Union. Enabling investors to re-orient investments towards more sustainable technologies and businesses will be key in making Europe climate neutral by 2050.

The Taxonomy is a science-based transparency tool for companies and investors. It creates a common language that investors can use when

**Enabling investors to re-orient investments towards more sustainable technologies and businesses will be key in making Europe climate neutral by 2050. The Taxonomy is a science-based transparency tool for companies and investors. It creates a common language that investors can use when investing in projects and economic activities that have a substantial positive impact on the climate and the environment.**

investing in projects and economic activities that have a substantial positive impact on the climate and the environment. It also introduces disclosure obligations on companies and financial market participants. While the EU has common climate and environmental targets, the national energy mix is a Member State prerogative and varies from one Member State to another,

with some still heavily reliant on high carbon-emitting coal. The Taxonomy helps mobilise private investors towards the climate objectives and covers energy activities that reflect different national situations and starting points.

Source: [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_711](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_711), 02 February 2022.

**FRANCE**

**France to Build 6 New Nuclear Reactors in Coming Decades, Says President Macron**

France will build at least six new nuclear reactors in the decades to come, President Emmanuel Macron said on 10 February, placing nuclear power at the heart of his country's drive for carbon neutrality by 2050. Macron said the new plants would be built and operated by state-controlled energy provider EDF (EDF.PA) and that tens of billions of euros in public financing would be mobilized to finance the projects and safeguard EDF's finances. "What our country needs, and the conditions are there, is the rebirth of France's nuclear industry," Macron said, unveiling his new nuclear strategy in the eastern industrial town of Belfort.

Promising to accelerate the development of solar and offshore wind power in France, Macron also announced he wanted to extend the lifespan of older nuclear plants to 50 years or more from 40 years currently, provided it was safe. The announcement comes at a difficult time for debt-laden EDF, which is facing delays and budget over-runs on new nuclear plants in France and Britain, and corrosion problems in some of its ageing reactors. The nuclear blueprint cements France's commitment to nuclear power, a mainstay of the country's post-war industrial prowess but whose future was uncertain after Macron and his predecessor had promised to reduce its weight in the country's energy mix.

**Today we face I think the most significant change in our strategic environment since the Second World War," including from hypersonic technology. The test flight, he said, is important not just for offensive capabilities, but for research in how to bolster Australia's defenses.**

**The European Union is set to classify a number of energy sources as sustainable or not sustainable in the coming weeks. Habeck said his "personal opinion" was that "Germany should vote no" on the proposal, should it remain in the plans "in the form that it is currently included.**

Macron's thinking has been reshaped by the European Union's ambitious goals for carbon neutrality within three decades, which put renewed focus on energy forms that emit fewer, or zero, greenhouse gases than fossil fuels, including nuclear. Surging energy prices and concerns about Europe's reliance on imported Russian gas have also persuaded French officials of the region's need for more energy independence. EDF estimates the cost of six new EPR reactors at about 50 billion euros, depending on financing conditions.

The first new reactor, an evolution of the EPR, would come online by 2035, Macron said. Studies for a further eight reactors beyond the initial half-dozen new plants would be launched, he added. France will also increase its solar power capacity tenfold by 2050 to more than 100 GW

and target building 50 offshore wind farms with a combined capacity of at least 40 GW. Capacity from land-based wind turbines, which face strong public resistance, would only be doubled by 2050, he said.

**Energy U-Turn:** Macron's decision to extend the lifespan of existing plants marked a U-turn on an earlier pledge to close more than a dozen of EDF's 56 reactors by 2035. Nuclear safety still divides Europe after Japan's Fukushima disaster. France lobbied hard for nuclear to be labelled as sustainable under new European Commission rules on green financing. If the new EU taxonomy rules are approved, it should reduce the cost of financing nuclear energy projects.

Macron said the state would assume its responsibilities in securing EDF's finances, indicating that the government may inject fresh capital into the 84% state-owned firm. The State

will assume its responsibilities in securing EDF's finances and its short- and medium-term financing capacity," Macron said. EDF's EPR reactors have suffered a troubled history. EPR projects at Flamanville in France and Hinkley Point in Britain are running years behind schedule and billions over budget, while EPR reactors in China and Finland have been hit by technical issues.

Separately EDF revised lower its output forecast for its nuclear fleet to 295-315 TWh compared to 361 TWh last year, in part due to extended reactor shutdowns due to corrosion problems in several reactors. If the level drops below 300 TWh, it would be at its lowest since 1990. Compounding EDF's difficulties, Macron, who faces a re-election battle in two months and is striving to head off public anger over rising energy bills, has ordered the utility to sell more cheap power to rivals - a move that is will knock about 8 billion euros off EDF's 2022 core earnings.

**EDF's Share Price is Down 18% so Far in 2022:** EDF confirmed on 10 February that it would buy a France-based nuclear turbine unit from General Electric as the utility looks to bundle nuclear activities deemed to be strategic.

Source: <https://www.indiatoday.in/world/story/france-new-nuclear-reactors-carbon-neutrality-2050-president-emmanuel-macron-1911494-2022-02-10>, 10 February 2022.

## **SOUTH AFRICA**

### **South Africa Seeks Proposals for New Research Reactor**

**NECSA - the South African Nuclear Energy Corporation - has released a Request for Information (RFI) for the Multipurpose Reactor (MPR) to replace the 56-year-old Safari-1 research reactor located at Pelindaba.** In September 2021, the South African cabinet approved the construction of the MPR to replace

the 20 MWt Safari-1, which is scheduled to retire in 2030. The reactor is operated by Necsa, with isotope production through Necsa's wholly-owned NTP Radioisotopes subsidiary. Safari-1 is one of the four leading producers of medical radioisotopes in the world used to treat millions of patients annually.

It also provides support for scientific research, development and innovation in medicine, agriculture, palaeontology and bioscience. Safari-1 is the main supplier of medical radioisotopes in Africa and can supply up to 25% of the world's molybdenum-99 needs. It has been converted from highly-enriched uranium to low-enriched uranium and has been using low-enriched uranium targets for radioisotope production since 2010.

In addition to radioisotope production, the MPR will substantially expand research capabilities and outputs. The new reactor is to be equipped with a cold neutron source, which will be the only one available in Africa. The MPR RFI includes technical, financial, financing and project management aspects related the following facilities: the Multipurpose Reactor Facility, including all buildings and systems for the operation of the MPR equipped with isotope production and fuel/material testing infrastructure as well as neutron sources, beams and guides; a neutron beam line centre equipped with an extensive suite of neutron scattering instruments; the fuel fabrication facility; the isotope processing facility; and on-site accommodation. ...

Source: <https://www.world-nuclear-news.org/Articles/South-Africa-seeks-proposals-for-new-research-reactor>, 07 February 2022.

## **UK**

### **Major Breakthrough on Nuclear Fusion Energy**

European scientists say they have made a major breakthrough in their quest to develop practical

**September 2021, the South African cabinet approved the construction of the MPR to replace the 20 MWt Safari-1, which is scheduled to retire in 2030. The reactor is operated by Necsa, with isotope production through Necsa's wholly-owned NTP Radioisotopes subsidiary. Safari-1 is one of the four leading producers of medical radioisotopes in the world used to treat millions of patients annually.**

nuclear fusion - the energy process that powers the stars. The UK-based JET laboratory has smashed its own world record for the amount of energy it can extract by squeezing together two forms of hydrogen. If nuclear fusion can be successfully recreated on Earth it holds out the potential of virtually unlimited supplies of low-carbon, low-radiation energy. The experiments produced 59 megajoules of energy over five seconds (11 megawatts of power). This is more than double what was achieved in similar tests back in 1997.

It's not a massive energy output - only enough to boil about 60 kettles' worth of water. But the significance is that it validates design choices that have been made for an even bigger fusion reactor now being constructed in France. ...The ITER facility in southern France is supported by a consortium of world governments, including from EU member states, the US, China and Russia. It is expected to be the last step in proving nuclear fusion can become a reliable energy provider in the second half of this century. Operating the power plants of the future based on fusion would produce no greenhouse gases and only very small amounts of short-lived radioactive waste. ...

Fusion works on the principle that energy can be released by forcing together atomic nuclei rather than by splitting them, as in the case of the fission reactions that drive existing nuclear power stations. In the core of the Sun, huge gravitational pressures allow this to happen at temperatures of around 10 million Celsius. At the much lower pressures that are possible on Earth, temperatures to produce fusion need to be much higher - above 100 million Celsius. No materials exist that can withstand direct contact with such heat. So, to achieve fusion in a lab, scientists have devised a solution in which a super-heated gas, or plasma, is held inside a doughnut-shaped magnetic field.

**The Joint European Torus (JET), sited at Culham in Oxfordshire, has been pioneering this fusion approach for nearly 40 years. And for the past 10 years, it has been configured to replicate the anticipated ITER set-up. The French lab's preferred "fuel" to make the plasma will be a mix of two forms, or isotopes, of hydrogen called deuterium and tritium.**

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for the latest tests, new walls for the vessel were constructed out of the metals beryllium and tungsten. These are 10 times less absorbent.

The JET science team then had to tune their plasma to work effectively in this new environment. "This is a stunning result because they managed to

demonstrate the greatest amount of energy output from the fusion reactions of any device in history," commented Dr Arthur Turrell, the author of *The Star Builders: Nuclear Fusion And The Race To Power The Planet*. "It's a landmark because they demonstrated stability of the plasma over five seconds. That doesn't sound very long, but on a nuclear timescale, it's a very, very long time indeed. And it's very easy then to go from five seconds to five minutes, or five hours, or even longer."

JET can't actually run any longer because its copper electromagnets get too hot. For ITER, internally cooled superconducting magnets will be used. Fusion reactions in the lab famously consume more energy to initiate than they can output. At Jet, two 500 megawatt flywheels are used to run the experiments. But there is solid evidence that this deficit can be overcome in the future as the plasmas are scaled up. ITER's toroidal vessel volume will be 10 times that of JET. It's hoped the French lab will get to breakeven. The commercial power plants that come after

should then show a net gain that could be fed into electricity grids.

This is a long game and it's significant that of the 300 or so scientists working as JET, a quarter are in the early part of their careers. They will have to carry the baton of research forward. ... Many technical challenges remain, however. In Europe, these challenges are being worked on by the Euro fusion consortium, which comprises some 5,000 science and engineering experts from across the EU, Switzerland and Ukraine. The UK is a participant, too. Its full involvement in ITER, however, will require first for Britain to "associate" to

certain EU science programmes, something that so far has been held up by disagreements over post-Brexit trading arrangements, particularly in relation to Northern Ireland. JET is likely to be decommissioned after 2023 with ITER beginning plasma experiments in 2025, or soon after.

Source: Jonathan Amos, <https://www.bbc.com/news/science-environment-60312633>, 09 February 2022.

## **NUCLEAR COOPERATION**

### **CHINA-ARGENTINA**

#### **China and Argentina Sign Nuclear Project Deal**

**Nucleoeléctrica Argentina and China National Nuclear Corporation (CNNC) have signed an engineering, procurement and construction contract for the development of the Atucha 3 nuclear power plant.** The nuclear power plant, to be sited near Lima, about 100 kilometres north west of Argentina's capital, Buenos Aires, will use China's Hualong One technology - the HPR1000 reactor, which will use

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enriched uranium as fuel and light water as coolant and moderator, with a rated gross power of 1200 MWe and an initial life of 60 years.

The contract was signed by the director of Nucleoeléctrica Argentina José Luis Antúnez and CNNC President Yu Jianfeng in an online event also attended by the countries' ambassadors to each other, and other dignitaries. It is part of cooperation agreements between the two countries, including the one signed in 2015 for cooperation on the construction project for a pressurised water reactor in Argentina. The two companies said it was the beginning of a new cycle of cooperation and mutual

understanding "which both companies foresee will be of auspicious prosperity for both nations, allowing the strengthening of ties for the peaceful development of nuclear energy generation, nuclear science and technology and industrial development".

In a statement, CNNC said it was a deal that would help "green and low-carbon development, jointly address climate change, help achieve the global goal of carbon peaking and carbon neutrality and jointly build a nuclear energy community with a shared future for mankind". ... Vice president of Argentina's National Atomic Energy Commission, Diego Hurtado de Mendoza, welcomed the "historic event", adding that "the

fact of having China as a partner on the fourth plant for Argentina is a window to multipolarity and, on the other hand, it also means having a locomotive for the nuclear sector."

Hualong One is a third generation nuclear power plant jointly developed by China National Nuclear

Corporation and the China General Nuclear Power group. The development in Argentina will be the second outside China, following one in Karachi in Pakistan. The construction project is part of Argentina's nuclear action plan agreed in June, which involves an investment of more than USD8 billion. Argentina's nuclear sector has three pressurised heavy water reactors with a total generating capacity of 1641 MWe across the Atucha 1, Atucha 2 and Embalse power plants.

*Source: <https://www.world-nuclear-news.org/Articles/China-and-Argentina-sign-nuclear-project-deal>, 02 February, 2022*

## **UKRAINE-CANADA**

### **Ukraine and Canada Agree Closer Nuclear Cooperation**

A MoU was signed by OCNI president Ron Oberth and Energoatom's acting president, Petro Kotin, at a virtual signing ceremony in Canada and Ukraine. Areas it covers include supporting cooperation opportunities associated with deployment of Canadian large-scale and small modular reactor technologies in Ukraine, nuclear decommissioning, medical isotopes and hydrogen production with nuclear electricity. It also aims to encourage cooperation between academics and researchers in the two countries.

In a statement issued after the signing Oberth said: "OCNI looks forward to working closely with colleagues in Ukraine on projects that support global initiatives to achieve net zero by 2050 and improve the health of people around the world." Kotin said: "Energoatom is pleased to establish partnership relations with OCNI, which opens new opportunities for our engagement with Canadian companies on the most promising areas in the nuclear energy field associated with ensuring reliable nuclear generation, nuclear research and development, innovation and care for the environment and people." OCNI is an association of 240 Canadian suppliers to the nuclear industry. The Ukraine state enterprise Energoatom operates

four nuclear power plants with 15 power units.

*Source: <https://www.world-nuclear-news.org/Articles/Ukraine-and-Canada-agree-nuclear-partnership>, 04 February 2022.*

## **UK-CHINA**

### **UK Regulators Approve China's UK HPR 1000 Design**

The UK HPR1000 reactor is suitable for construction in the UK, the Office for Nuclear Regulation (ONR) and the Environment Agency have concluded. The UK HPR1000 is the Hualong One design that General Nuclear Services (GNS) - a subsidiary of EDF and China General Nuclear (CGN) - proposes to use at a prospective new nuclear power plant in Bradwell, England. The Generic Design Assessment (GDA) is a voluntary

**The UK HPR1000 is the Hualong One design that General Nuclear Services (GNS) - a subsidiary of EDF and China General Nuclear (CGN) - proposes to use at a prospective new nuclear power plant in Bradwell, England. The Generic Design Assessment (GDA) is a voluntary process for reactor vendors that applies to England and Wales, and is a policy rather than law, but it is a British government expectation for all new build projects.**

process for reactor vendors that applies to England and Wales, and is a policy rather than law, but it is a British government expectation for all new build projects. A reactor vendor, or the 'requesting party', has completed the GDA process when it receives a Design Acceptance Confirmation (DAC) from the nuclear regulator and a Statement of Design Acceptability (SoDA) from environmental

regulators.

CGN and EDF submitted a joint application through their joint venture company GNS to the Department for Business, Energy & Industrial Strategy (BEIS) in October 2016 to begin the GDA process for a UK version of its HPR1000. The application was accepted in January 2017, marking the start of the four-step GDA process. Following completion of their in-depth assessment of the reactor design, the ONR and the Environment Agency have said they are satisfied that the reactor meets regulatory expectations on safety, security and environmental protection at this stage of the regulatory process. ONR has issued a DAC and the Environment Agency has issued a SoDA for the design.

"The UK HPR1000 design has been assessed



against the high levels of safety and security expected in the UK, and issuing the Design Acceptance Confirmation - after rigorous and detailed assessments undertaken by a wide range of my specialist inspectors - means we consider the UK HPR1000 design is suitable for deployment in the UK," said ONR Chief Nuclear Inspector Foy. The Nuclear Regulation Manager at the Environment Agency, added: "We've completed a rigorous assessment of the UK HPR1000 and concluded that it is capable of meeting those high standards that we expect. This is why we are issuing a Statement of Design Acceptability for the UK HPR1000 to the partners in this design, China General Nuclear, EDF and General Nuclear International Ltd."

The regulators have previously carried out GDAs for: EDF-Areva's UK EPR, completed in December 2012 and currently under construction at Hinkley Point C in Somerset and proposed for construction at Sizewell C in Suffolk; Westinghouse's AP1000, completed in March 2017; and Hitachi-GE's Advanced Boiling Water reactor, completed in December 2017. Bradwell Power Generation Company Limited - a joint subsidiary of CGN and EDF - is proposing to construct and operate a nuclear power station using twin UK HPR1000s at its site near the existing Magnox power station site at Bradwell in Essex. CGN is constructing two demonstration HPR1000 reactors at the Fangchenggang site in China's Guangxi Autonomous Region, about 45km from the border with Vietnam.

This is the reference plant for the Bradwell project. First concrete was poured for the nuclear island of unit 3 of the Fangchenggang plant - 39% owned by Guangxi Investment Group and 61% by CGN - in December 2015, while that for unit 4 was poured a year later. Those units are expected to start up in the second half of 2022 and the first half of 2024, respectively. In November 2020, the HPR1000 design was formally certified as compliant by the European Utility Requirements

organisation - a technical advisory group for European utilities on nuclear power plants.

Source: <https://www.world-nuclear-news.org/Articles/Regulators-complete-review-of-UK-HPR1000-design>, 07 February 2022.

## **NUCLEAR PROLIFERATION**

### **NORTH KOREA**

#### **Amid Rising Tensions, Kim Jong Un Plans to Follow his Missile Barrage with a Military Parade**

North Korea is stepping up preparations for military parade that could come as soon as next week, ratcheting up tensions after a January barrage of missile tests forced Kim Jong Un's nuclear arsenal back on the Biden administration's agenda. Commercial satellite imagery of North Korea's parade training ground taken showed several hundred personnel in formation, likely signalling a forthcoming celebration, U.S.-based specialist service 38 North reported. In a separate report from NK News, information from satellite imagery and informed sources on the ground in Pyongyang indicated plans to hold a parade for one or more upcoming holidays.

Two big events on the North Korean calendar are the Feb. 16 holiday for what would have been the 80th birthday of former leader Kim Jong Il, and the April 15 holiday to mark what would have been the 110th birthday of state founder Kim Il Sung. Kim Jong Un—the son and grandson of the two former leaders—has used parades to show off the state's missiles designed to deliver nuclear weapons to the U.S. mainland and America's allies in Asia. The lack of vehicle activity at the training ground indicates that if there's a parade next week, he likely won't be rolling out any major weaponry...

But the event where soldiers march through

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central Pyongyang would be used to rally support at home, where the state is battling one of its worst food shortages in years. It would come after the foreign ministers from the U.S., South Korea and Japan meet in Hawaii to discuss a record monthly barrage of missile tests in January under the North Korean leader of nuclear-capable rockets designed to evade U.S.-operated interceptors.

Martyn Williams, a fellow at the Stimson Center who co-authored the 38 North article, said a parade next week for the Kim Jong Il holiday is possible. "North Korea does do big parades that consist mostly of people marching. They don't get as much publicity, but this could be one of those," he said. "If I was to guess between the two, I'd say the April 15 holiday for Kim Il Sung is more likely to see a major parade." So far the Biden administration hasn't budged to North Korea's demands that it ease up on sanctions choking its economy. While Washington has said the door is open for Kim to return to nuclear disarmament talks stalled for about three years, publicly it has offered nothing new to entice him back to negotiations. South Korean President Moon Jae-in believes President Biden and Kim Jong Un will meet eventually to discuss Pyongyang's nuclear weapons program, Yonhap News Agency reported, citing a joint written interview. Kim hasn't shown interest in returning to talks with the U.S. while Biden hasn't indicated his inclination for a meeting with the North Korean leader. Kim met former President Donald Trump three times, but their talks didn't lead to any concrete steps to wind down North Korea's nuclear arsenal — which grew in strength while their discussions

sputtered. North Korea has held off on missile tests while its neighbour and biggest benefactor China host the Beijing Olympics.

Source: <https://time.com/6146817/kim-north-korea-missile-parade/>, 10 February 2022.

## NUCLEAR NON-PROLIFERATION

### GENERAL

#### IAEA Chief Steps Up Drive to Strengthen Global Nuclear Non-Proliferation Regime

The head of the IAEA, Rafael Mariano Grossi, is seeking to convince more countries to join the majority of states in giving Agency inspectors wider access to locations and information as part of a push to further bolster the global nuclear non-proliferation regime. It is the latest initiative by the Director General to support the full implementation of a long-standing annual resolution adopted by IAEA Member States on strengthening Agency safeguards activities carried out to verify that nuclear material is not used for weapons purposes.

A quarter of a century ago, the IAEA Board of Governors approved an effective new inspection tool known as the Additional Protocol (AP) to plug gaps in the international safeguards system set up to ensure exclusively peaceful uses of the atom consistent with the 1970 Treaty on the NPT.

Nearly 140 countries have since implemented the AP in addition to their safeguards agreements with the IAEA, providing the Agency with enhanced inspection rights and broader access to information related to their nuclear programmes. However, more than 40 countries which agreed when they signed up to the NPT never to pursue nuclear weapons have yet to add

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an AP to their Comprehensive Safeguards Agreement (CSA) and grant the U.N. watchdog the broader verification powers it needs to confirm they are living up to their international commitments. Director General Grossi has now written to governments expressing his hope that they will soon conclude and bring into force an AP, noting that the General Conference – the annual gathering of the IAEA's 173 Member States – encourages all concerned countries to do so as soon as possible.

Since 1997, in its annual resolution on Strengthening the effectiveness and improving the efficiency of Agency safeguards, the General Conference has stressed the importance of the AP and recommended that “the Agency further facilitate and assist concerned Member States, at their request, in the conclusion and entry into force” of this and other safeguards instruments. It has also encouraged the Director General to continue his intensified efforts to this end. IAEA safeguards are an essential component of the international security architecture. The NPT is the centrepiece of global non-proliferation efforts. Under the Treaty's Article 3, each non-nuclear-weapon State is required to conclude a CSA with the IAEA. In the letters, the Director General said IAEA safeguards contribute to the strengthening of collective security in the world and help create an environment conducive to nuclear cooperation – a reference to the transfer of nuclear technology for peaceful purposes to help mitigate and adapt to climate change, boost food security, fight cancer and other diseases and much else.

“APs strengthen the effectiveness and improve the efficiency of IAEA safeguards,” he wrote. They also “significantly increase the IAEA's ability to verify that there are no undeclared nuclear material or activities in a State with a comprehensive safeguards agreement in force.” The AP is a legal instrument granting the IAEA complementary inspection authority to that provided in underlying safeguards agreements,

enhancing its ability to verify that the nuclear material and activities countries declare to the Agency are both correct and complete.

A main aim is to enable the IAEA to provide assurance about the absence of undeclared material and activities, as well as the non-diversion of declared nuclear material. “Without an AP in force the IAEA is not able to draw the conclusion that all nuclear material remains in peaceful activities in a State,” Director General Grossi wrote. The 35-nation IAEA Board of Governors approved the AP in May 1997 so that inspectors could prevent a repeat of non-proliferation failures in Iraq and North Korea, which both conducted secret nuclear activities in the early 1990s in violation of their NPT commitments. In the past 25 years, 138 countries have concluded an AP to their safeguards agreements with the IAEA. Noting this year's milestone anniversary of the Board's decision, Director General Grossi said he was reinvigorating

**In the past 25 years, 138 countries have concluded an AP to their safeguards agreements with the IAEA. Noting this year's milestone anniversary of the Board's decision, Director General Grossi said he was reinvigorating the IAEA's efforts to encourage the remaining States to conclude and bring into force an AP.**

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After taking office in December 2019, he has taken several steps aimed at strengthening the international non-proliferation regime. First, he sent official letters to 31

countries to replace the so-called Small Quantities Protocol (SQP) to their CSAs with a revised version providing for stricter verification measures or to rescind it altogether. Eight countries informed the Director General that they have so far done one or the other after receiving the letter. Director General Grossi has also sent letters to nine States Parties to the NPT that have yet to conclude and bring into force a CSA with the IAEA – something this treaty obliges them to do. Two countries have since brought into force such agreements.

*Source: <https://www.iaea.org/newscenter/pressreleases/iaea-chief-steps-up-drive-to-strengthen-global-nuclear-non-proliferation-regime>, 01 February 2022.*

NUCLEAR SECURITY

CHINA

**IAEA Supports China in Nuclear Security Efforts for Winter Olympics**

The IAEA is supporting China in its efforts to protect the Winter Olympics against any criminal or terrorist activities involving nuclear or other radioactive material. As with many other major international events over the past two decades, the Agency has provided training on nuclear security measures and lent hundreds of radiation detection instruments for the Games which run from 4 to 20 February in the capital Beijing. Major public events such as the Olympics draw great public interest and receive intense media attention. A terrorist attack involving nuclear or other radioactive material could result in severe consequences, depending upon the specific material involved, the mode of dispersal, the location and the population impacted.

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In total, the IAEA has provided nuclear security support for 66 major public events in 42 countries since 2004 to assist in the readiness to counteract a potential threat. This included support for past Olympic Games hosted by Brazil, China, Greece and Japan; Asia-Pacific Economic Cooperation (APEC) Summits in Chile and the Philippines; World Youth Days in Panama and Poland; the African Cup of Nations soccer tournament in Cameroon, Egypt and Gabon; and the World Expo in Kazakhstan. Assistance included equipment loans, training, tabletop and field exercises and technical visits by international experts. In the past six years the IAEA has lent over 3500 items of radiation detection equipment to countries across the world.

“Events on the scale of the Olympic Games present complex security challenges for a host State,” said Elena Buglova, Director of the IAEA Division of Nuclear Security. “The IAEA helps a country to build nuclear security capacities and boost personnel training. Greater and more visible

levels of security and surveillance and the implementation of strong monitoring procedures at major public events go a long way to deter criminal or terrorist acts”.

In the last two months, the IAEA held virtual seminars and training on nuclear security measures and equipment performance verification with the China Atomic Energy Authority (CAEA). The Agency also lent personal radiation detectors, radionuclide identification devices and portable radiation scanners to support the Games. “Following our successful collaboration with the IAEA on nuclear security for the Beijing Olympic Games in 2008, we have continued to work with the Agency in the field of nuclear security for major public events,” said Chen Fanglei, Deputy Director General of State Nuclear Security Technology Center, China. “The lessons learned during

preparation and conduct of the events will benefit other countries who seek support for major public events. Such support can act as a starting point to develop wider national nuclear security capabilities.”

An International Seminar on Nuclear Security Systems and Measures for Major Public Events, co-sponsored by the CAEA and the IAEA in October 2019 in Chengdu, China, analysed lessons from 15 years of IAEA support to countries as they incorporate nuclear security into security arrangements for major public events. As requests for such support continue to grow, the Agency plans a set of actions for the future to advance the assistance provided. These actions include the establishment of a comprehensive programme for assisting countries in preparing for major public events at the new IAEA Nuclear Security Training and Demonstration Centre at Seibersdorf, Austria, and the development of digital tools for supporting secure communications and assessing radiation alarms.

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-supports-china-in-nuclear-security-efforts-for-winter-olympics>, 03 February 2022.

## NORTH KOREA

### N. Korea Continues Nuclear Program, Profits from Cyberattacks: UN

North Korea has continued to improve its nuclear and ballistic missile programs in 2021 and cyberattacks on cryptocurrency exchanges turned out to be a significant revenue source for Pyongyang, an excerpt from a confidential UN report seen by Reuters.... The annual report by independent sanctions monitors was submitted on 04 February...to the U.N. Security Council North Korea sanctions committee. "Although no nuclear tests or launches of ICBMs were reported, North Korea continued to develop its capability for the production of nuclear fissile materials," the experts wrote. North Korea is formally known as the DPRK. Security Council has long banned the country from conducting nuclear tests and ballistic missile launches. "Maintenance and development of DPRK's nuclear and ballistic missile infrastructure continued, and DPRK continued to seek material, technology and know-how for these programs overseas, including through cyber means and joint scientific research," the report said. ...

Source: <https://www.dailysabah.com/world/asia-pacific/n-korea-continues-nuclear-program-profits-from-cyberattacks-un>, 06 February 2022.

## NUCLEAR SAFETY

## JAPAN

### IAEA Task Force on Fukushima Treated Water to Conduct its First Mission in Japan

A Task Force established by the IAEA to review the safety of the planned release of treated water from the Fukushima Daiichi nuclear power station will carry out its first mission in Japan next week. The mission will include technical discussions in Tokyo and a visit to the site of the 2011 accident, where Task Force members will observe handling of the water now stored in tanks. The Government of Japan announced its basic policy in April 2021

to gradually discharge the treated water into the sea subject to approval from its independent regulatory body. It requested the IAEA's assistance to help ensure it takes place in line with international safety standards and without harming public health or the environment. Director General Rafael Mariano Grossi said the IAEA would conduct the review and assist Japan before, during and after the release, which is planned to begin approximately two years after the basic policy announcement. After the two sides agreed on the project's Terms of Reference, the IAEA sent a team to Japan in September to begin implementation of the multi-annual review.

In a new step, the Task Force set up in 2021 to implement the IAEA's programme to review Japan's plans and actions related to the water discharge will be in the country from 14-18 February. Staff members from IAEA departments and laboratories, as well as eleven independent, internationally recognized experts with diverse technical competencies from Argentina, Australia, Canada, China, France, the Marshall Islands, the Republic of Korea, the

Russian Federation, the United Kingdom, the United States, and Viet Nam, make up the Task Force. On the last day of the visit, Lydie Evrard, IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security, will address the media at a virtual press conference. Director General Grossi emphasized the "enormous importance" of the Task Force's work, saying its members were among the world's leading scientists and experts in the areas of nuclear safety and radiation protection. It will demonstrate that the IAEA review is carried out in an objective, credible, and science-based manner and help send a message of transparency and confidence to people in Japan and beyond.

"The IAEA's Task Force, with its independent, technical and impartial members from across the globe, will play a crucial role in monitoring and

**IAEA would conduct the review and assist Japan before, during and after the release, which is planned to begin approximately two years after the basic policy announcement. After the two sides agreed on the project's Terms of Reference, the IAEA sent a team to Japan in September to begin implementation of the multi-annual review.**

reviewing Japan's implementation of its water release plan," he said. "The Task Force will verify that the water discharge is conducted safely. This will help reassure people in Japan and elsewhere in the world, especially in neighbouring countries." The Task Force members will not work in a national capacity but instead serve in their individual professional roles, managed by the IAEA and reporting to its Director General. The findings from each mission to Japan will be published and then compiled into a full report on the overall safety of the water discharge prior to its planned start. In part used to cool melted reactor fuel, water from the Fukushima Daiichi nuclear power station is treated through a process known as Advanced Liquid Processing System (ALPS) to remove radionuclides except tritium and then stored at the site. Sustainable water management is key for continued progress in the decommissioning of plant, as the tanks holding the water occupy a large area of the coastal site in eastern Japan and are nearing full capacity. Under the agreed terms, the IAEA will examine key safety elements of Japan's discharge plan, including:

- The radiological characterization of the water to be discharged.
- Safety related aspects of the water discharge process.
- The environmental monitoring associated with the discharge.
- The assessment of the radiological environmental impact related to ensuring the protection of people and environment.
- The regulatory control including authorization,

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inspection and review and assessment.

While on site for the review mission, Task Force members will observe Japan's handling of the ALPS treated water held in the storage tanks. This will provide useful information to IAEA laboratories as they develop detailed procedures to corroborate the radioactivity measurement results which will be reported by Japan throughout the review. In Tokyo, the Task Force will meet with experts from the Ministry of Economy, Trade and Industry and the Tokyo Electric Power Company Holdings (TEPCO), the operator for the stricken power station.

"The Task Force has prepared thoroughly ahead of next week's mission, and we have also received detailed information from our Japanese counterparts," Deputy

Director General Evrard said. "This will help ensure a productive and effective work week." ... A few members of the Task Force will remain in Japan following next week's mission to begin preparations for reviewing the regulatory aspects of the discharge. The IAEA and Japan have been cooperating extensively over the past decade to deal with the aftermath of the Fukushima Daiichi accident, in areas such as radiation monitoring, remediation, waste management and decommissioning. The IAEA's safety reviews are based on its safety standards, which constitute the worldwide reference for protecting the public and the environment from harmful effects of ionizing radiation.

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-task-force-on-fukushima-treated-water-to-conduct-its-first-mission-in-japan>, 07 February 2022.

**NUCLEAR WASTE MANAGEMENT**

**AUSTRALIA**

**IMSR Developer Partners with ANSTO on Waste Treatment Technology**

The Australian Nuclear Science and Technology Organisation (ANSTO) and Terrestrial Energy are to explore ANSTO's Synroc proprietary waste treatment technology for used fuel management from the operation of Terrestrial's Integral Molten Salt Reactor (IMSR). ANSTO is to provide technical consulting services to Canada-based Terrestrial Energy for the conditioning of used reactor fuel from the operation of IMSR heat and power plants in Canada, the UK, USA and other global markets. Synroc - "synthetic rock" - is an Australian innovation for the storage of complex intermediate and high-level radioactive waste developed by ANSTO, based on crystalline or mineral phases that have survived in natural geological environments at elevated temperatures in the presence of water for hundreds of millions of years.

ANSTO's waste treatment technology delivers a tailored waste form chemistry with associated process technology, which can safely and securely accommodate a broad range of waste forms that meet international requirements for long-term disposal of used reactor fuel, Terrestrial Energy said. The technology also significantly reduces the volume of waste for disposal, lowering long-term lifecycle costs. Simon Irish, CEO of Terrestrial Energy, said Synroc waste treatment technology delivers the safety and security standards for used fuel that are expected and demanded by both the public and regulators. "In many ways, this technology completes the IMSR's fuel cycle, from rock to clean energy production, and back to rock again," he said.

ANSTO began construction in 2018 of a Synroc waste treatment plant to process the

intermediate-level liquid waste from nuclear medicine production from its molybdenum-99 production facility at Lucas Heights, near Sydney.

**Synroc - "synthetic rock" - is an Australian innovation for the storage of complex intermediate and high-level radioactive waste developed by ANSTO, based on crystalline or mineral phases that have survived in natural geological environments at elevated temperatures in the presence of water for hundreds of millions of years.**

The development of the ANSTO Synroc Facility is funded by the Australian Government. ...Terrestrial Energy's IMSR uses molten salt as both fuel and coolant, with integrated components, that can supply heat directly to industrial facilities or use it to generate electrical

power. Terrestrial Energy aims to commission the first power plants based on the small modular reactor within a decade.

*Source: <https://www.world-nuclear-news.org/Articles/IMSR-developer-partners-with-ANSTO-on-waste-treatm>, 03 February 2022.*

**UK**

**UK Integrates Nuclear Waste Services**

UK Nuclear Waste Services, launched on 31 January, brings together in a single organisation the long-established expertise of site operator Low Level Waste Repository Limited, Geological Disposal Facility (GDF) developer Radioactive Waste Management Limited and the Nuclear Decommissioning Authority (NDA) group's Integrated Waste Management Programme. This business will maintain its current commitments to the Low Level Waste Repository and to the GDF programme and the communities involved with both. It also creates a business with new capability to manage UK nuclear waste safely and securely for generations to come. Nuclear Waste Services will build on work delivered over many decades, while adding more essential services for customers in the nuclear energy, defence, industrial, medical, and research sectors, NDA said.

Nuclear Waste Services will be led by CEO Corhyn Parr, formerly NDA's Director of Integrated Waste, and Board Chair Adrienne Kelbie. ... NDA announced its decision to create the new business

at the start of 2021, as part of wider moves to simplify structures across the group and enhance capabilities. NDA is responsible for the management, decommissioning and clean-up of 17 nuclear sites across the UK. Nuclear Waste Services will oversee the group's integrated waste programme. ...

The Nuclear Waste Services portfolio includes:

- Major Capital Programmes - Developing a permanent disposal capability for higher-activity UK radioactive wastes in a GDF; one of the largest environmental protection and infrastructure programmes in the UK.

- Waste Operations – Ensuring the continued safe, compliant, and effective management of the Low Level Waste Repository Site.

- Waste Services - Working with customers to provide the services and solutions to address their challenges, as well as managing contracts and relationships across the waste cycle.

- Integrated Waste Management Programme – Developing new opportunities and capabilities to realise the benefits of working at scale across the NDA group.

*Source: <https://www.neimagazine.com/news/newsuk-integrates-nuclear-waste-services-9458408>, 03 February 2022.*



Centre for Air Power Studies

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal Anil Chopra, PVSM AVSM VM VSM (Retd).

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**Composed by: CAPS**

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