



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

OPINION – Manpreet Sethi

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AUKUS from an Indian Perspective

Ever since AUKUS (Australia – UK – US trilateral security partnership) was announced, reams have already been written on it. Nations of Europe, and the Asia-Pacific have proffered their interpretation of this tripartite strategic pact whose centrepiece constitutes the eight SSNs that will become available to Australia. The pact also envisages sharing of information and know-how in technologies like artificial intelligence, long-range strike capabilities, etc. Evidently, AUKUS illustrates American willingness to share its advanced technologies with allies as a way to buttress its own security against a common threat perception.

Unlike the Russian lease of an SSN to India from 1988 to 1991 and then from 2011 to 2021, AUKUS envisages transfer of technology to Australia to build, operate and eventually decommission the platforms. The technical dimensions of the agreement are not yet clear. These are likely to be ironed out over the next year and a half by a special working group. Nevertheless, the Australian Prime Minister has clarified that his

Evidently, AUKUS illustrates American willingness to share its advanced technologies with allies as a way to buttress its own security against a common threat perception. Unlike the Russian lease of an SSN to India from 1988 to 1991 and then from 2011 to 2021, AUKUS envisages transfer of technology to Australia to build, operate and eventually decommission the platforms.

country has no desire for nuclear weapons and would not be building any fuel enrichment capabilities for the naval nuclear reactors. Highly enriched uranium, which is likely to fuel the reactors, would be made available by the US and UK. The three countries have also approached the IAEA to work out a safeguards agreement for this nuclear material. The Agency, though, has no ready template to offer on this. Interestingly also, Australia has no experience

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of operating nuclear power plants, though it is the third largest producer of uranium, and has operated a research reactor for production of medical isotopes since 1958.

Implications for India: There are two prisms through which India can perceive this deal – first, from that of its national security with particular concern about China; and second, from that of the precedent it sets with regional and global security implications. Seen from the lens of national security, an AUKUS arrangement that seeks to deter China, a country that has displayed expansionist tendencies and aggressive positions against India over the last few years, is a welcome move. It will likely distract China and complicate its security, thereby easing the pressure on India.

Also, the availability of SSNs, with their advantages of greater stealth, endurance, and carrying capacity, with a partner of India in the Quad will strengthen the overall military power projection in the Indo-Pacific. From India's perspective, AUKUS would not diminish the role of Quad; rather, it would add military teeth to the grouping, and thus enhance deterrence. In any case, many bi/tri-lateral groupings are already dotting the Indo-Pacific landscape and India has no reason to be concerned about them.

However, what could turn out to be problematic for India is the precedent that AUKUS sets in the US providing technology and material for nuclear powered submarines to another. Given the potential proliferation risks involved in such transfers, an activity of this kind has been avoided across the world. As stated earlier, even Russia had only leased a nuclear powered submarine to India, without any transfer of technology.

AUKUS could open the doors for other nuclear armed countries to make similar offers. The China-Pakistan nuclear collaboration could take such a turn. China, which has, expectedly, expressed

strong criticism of the tripartite agreement, may attempt to get back by making a similar offer to its iron brother, Pakistan. It is well known that Pakistan has been keen to equip its naval Strategic Forces Command with credible platforms. Availability of SSNs would help learn the nuances of naval propulsion, besides training for operations on such platforms. Meanwhile, for China that is openly seeking parity with the US in being a global rule-maker, this would be an opportunity to establish its own credentials. North Korea and Iran could also be potential Chinese customers.

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The US has described this as a "one-off special arrangement", an exception made for an ally that can play a part in the efforts to deter a common adversary. But the problem with this logic is that the adversary may also want to make a similar exception for its own allies. While the US has offered this technology to a

country that is a NNWS under the NPT and holds a good compliance record, China, may offer it to non-NPT, nuclear armed states that do not have full-scope safeguards arrangements with the IAEA. Or perhaps to an NPT member with a less than satisfactory compliance history. Given that all such nations also have their nuclear expertise and existing enrichment/reprocessing infrastructure, they could also be more adept at proliferation.

Global and Regional Implications: The precedent, therefore, of the AUKUS agreement could have global implications. In this case, there is no reason to disbelieve Australia – the beneficiary country's assurance that it would follow strict safeguards discipline. But, would it be the same for future recipients of such technologies? Brazil and South Korea are already expressed interest in SSNs. In fact, France has been involved with the non-nuclear part of Brazil's SSN construction. Much miffed by AUKUS, France may now want to explore the possibility of stepping into the nuclear dimension of Brazil's submarine as well. AUKUS may open the race for transfer/acquisition of such

capabilities between interested collaborators. The 'one-off' reasoning could, then, become redundant.

The issue is likely to reverberate at the NPT RevCon rescheduled for January 2022. It may create ripples within the five NWS, but also between the NWS and NNWS. In order to mitigate disturbing consequences, it might be a good idea for Washington DC and London to think through options that they can offer for larger applicability, in case SSN proliferation becomes a reality. The discussions on clear pathways for ensuring a responsible and reliable stewardship of this sensitive technology will have to be broad-based than earlier envisaged by AUKUS.

While the NPT does not prohibit NNWS from building or operating nuclear-powered ships, the NNWS is required to place all their nuclear material and facilities under IAEA's comprehensive safeguards agreement (CSA). Even then it might be a challenge for the Agency to safeguard submarine naval reactors owing to the secrecy around their basing. To get around this problem, the CSA exempts safeguards on nuclear material used in a "non-proscribed military activity," such as naval reactors. However, since only six countries, all with nuclear weapons, have currently been operating SSNs, practical issues around such exemptions and safeguards had never presented themselves. These will now need to be addressed with adequate thought and consideration.

AUKUS has been crafted to address the looming security concern being posed by China in the Indo-Pacific. It plans to do so by strengthening the

deterrent capability of a prominent US regional ally within a short to medium time frame. At the same time, it also ends up opening the possibility of new security dilemmas in the long term.

Source: <https://www.apln.network/projects/aukus/aukus-from-an-indian-perspective>, 29 September 2021.

OPINION – Garimella Subramaniam

A Selective Nuclear Policy

The resumption of North Korea's largest fissile material production reactor, after operations were ceased in December 2018, has sparked speculation about its real and symbolic significance. The IAEA has underlined that the restart of activity in Yongbyon constitutes a violation of UNSC resolutions. This is the same reactor that the North Korean leader Kim Jong-un, in a bilateral summit in 2019 with then U.S. President Trump, offered to fully dismantle in exchange for securing complete relief from international economic sanctions, but to little avail. The ageing five-megawatt reactor at the Yongbyon complex has been central to the North Korean reprocessing of spent fuel rods to generate plutonium, besides the production of highly enriched uranium for the development of atomic bombs. But observers also point to the diversification of the country's nuclear weapons and missile programmes to covert locations over time. Hence, they are cautious not to exaggerate the importance of the recent reopening.

Confusion over Motives: Indeed, the opaque nature of Pyongyang's nuclear programme partly

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accounts for the current confusion over the motives behind the restart of the reactor. In June 2008, in order to buttress its denuclearisation commitment to the US and four other countries, Pyongyang blew up the cooling tower at the Yongbyon complex. The move did little to assuage the concerns of critics, either regarding the plutonium stockpile the regime had amassed or its engagement in clandestine nuclear proliferation. But it nevertheless led former US President Bush to ease some sanctions against North Korea, which he had in 2002 dubbed part of the "axis of evil." ... A few months after blowing up the cooling tower in 2008, Pyongyang barred IAEA inspectors' access to its reprocessing plant in the Yongbyon complex and eventually expelled them the following April. In November 2010 American scientist Siegfried Hecker confirmed accounts that North Korea had rapidly built a uranium enrichment plant at Yongbyon.

The above sequence of developments was almost a rerun of events nearly a decade earlier. In 1994, Pyongyang barred IAEA access to the Yongbyon complex amid suspicions that the country was generating plutonium from spent fuel. The US had initially planned pre-emptive precision strikes on the nuclear sites, but was deterred against such a misadventure by a blueprint for a peace deal brokered by President Jimmy Carter. The so-called 1994 Agreed Framework, an executive agreement signed by President Bill Clinton, required Pyongyang to freeze all nuclear activity and allow inspection of its military sites in return for the construction of two light water reactors. The accord broke down in 2002.

Pragmatic Path: The Biden administration has adopted a pragmatic path of declaring its

readiness to resume negotiations with Pyongyang without the grandiose distractions of the Trump era that amounted to exerting little diplomatic leverage. Meanwhile, Mr. Kim has spurned all such overtures until he can win concrete relief from sanctions, especially those relating to raw materials exports. Apart from the punitive impact of such measures on an impoverished people, the protracted stand-off over North Korea reinforces the hollowness of the doctrine of deterrence and begs the question whether proliferation can ever be prevented just because nuclear weapons states want to perpetuate their dominance. The UN treaty on complete abolition of atomic arms, whose deliberations were boycotted by all nuclear weapons states, is the morally superior alternative.

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The US, UK, and Australia have announced the establishment of a security alliance known as AUKUS. One of the key elements of this military alliance is that Washington and London will help Canberra develop nuclear-powered submarines.

Source: <https://www.thehindu.com/opinion/op-ed/a-selective-nuclear-policy/article36422251.ece>, 13 September 2021.

OPINION – Guo Xiaobing

AUKUS Plans to Provide Nuclear Submarines to Australia Seriously Endangers Nuclear Non-Proliferation

The US, UK, and Australia have announced the establishment of a security alliance known as AUKUS. One of the key elements of this military alliance is that Washington and London will help Canberra develop nuclear-powered submarines. It is an act by the US and UK, two nuclear-weapon states, to secretly support and provide carriers of weapons of mass destruction, nuclear technology, and nuclear materials to Australia, a non-nuclear-weapon state, within the Anglosphere. But the move apparently runs counter to the objectives and core obligations set by the NPT.

First, the AUKUS move will lead to the proliferation of carriers of WMD in the world. Although the nuclear-powered submarine is not a type of nuclear weapon itself, it still has the potential to carry nuclear weapons. It also belongs to an important platform for carrying WMD. There are only six countries in the world that have nuclear submarines, including China, the US, Russia, the UK, France, and India, all of which possess nuclear weapons as well. It is clear that nuclear-powered submarines and nuclear weapons are inextricably linked with each other.

Second, AUKUS will spread fissionable material that could be used to make nuclear weapons. The second paragraph of Article III of the NPT states that each member party to the Treaty undertakes not to provide special fissionable material to any non-nuclear-weapon state unless subject to various safeguards. The International Atomic Energy Agency has no authority to supervise nuclear materials for submarines because of their military implications, which has objectively created conditions for Australia to make nuclear weapons....

Third, the partnership between the UK, the US and Australia may lead to the proliferation of uranium enrichment technology. Washington and London's nuclear-powered submarines run on highly enriched uranium, while Canberra is rich in uranium deposits. If the US and the UK transfer the uranium-enriching technology to Australia to help it become self-sufficient in nuclear fuel, it would be no better than the international nuclear black market reported by the media in the early 2000s.

Fourth, the AUKUS move will negatively impact the international nuclear non-proliferation regime. Since Australia can openly acquire nuclear materials by developing nuclear-powered submarines, other non-nuclear-weapon states may follow suit, resulting in the endless risks of nuclear proliferation on our living planet.... And,

finally, the trilateral security partnership is almost certain to trigger a regional arms race....

Looking at the latest changes in nuclear policies of the US and the UK, it is needless to say that what these countries have done has disappointed the world. President Biden once campaigned in his election campaign to reduce the role of nuclear weapons in the US security policy. However, less than eight months after entering the White House, he is eating his campaign pledge. The same is also true with the UK. In March this year, the country adjusted its nuclear strategy drastically and took a significant step backward in its nuclear arms control. It not only increased its nuclear weapon stockpile cap from 180 to 260 warheads, but moved to lowered the threshold for the use of nuclear weapons. Peace, development, and nuclear non-proliferation are what most countries in the world

yearn for. The actions of the US, the UK, and Australia to challenge the bottom line of nuclear non-proliferation, won't bode well for our living world.

Source: <https://www.globaltimes.cn/page/202109/1234647.shtml>, 19 September 2021.

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OPINION – Helen Caldicott

Morrison Makes Soothing Noises about Nuclear Non-Proliferation, but what of Future Governments?

In 1971, radioactive isotopes were found in the Adelaide water supply having emanated from the French atmospheric tests being conducted on the Mururoa Atoll in the Pacific. As the Australian people learnt about the dangers posed by these tests, they rose up. Thousands marched in city streets, and entire pages of letters to the editor were published about the "bloody French". So powerful was this outcry that PM Whitlam took France to the ICJ, which ruled the tests were illegal. Some years later Australia decided to mine uranium. In 1977, the ACTU passed a resolution to neither mine, transport nor export uranium –

which stood until Bob Hawke introduced the three-mines policy.

Forty years later, where do we stand? Suddenly, PM Morrison announces that Australia will, with the assistance of Britain and the US, build nuclear-powered submarines in Adelaide.... US nuclear submarines are powered with highly enriched Uranium 235, which can be used as fuel for nuclear weapons and thus poses a serious potential global proliferation problem. Although Scott Morrison makes soothing noises about AUKUS and proliferation, we must look years, and indeed decades, ahead. Future Australian governments may feel free to act differently.

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Questions must be asked:
1. Will Australia enrich the uranium for the submarines, a process that requires huge amounts of electricity in a time of acute global warming?
2. Will the uranium be mined here?
3. How many subs are to be built?
4. Where will they berth? And how will the waste be dealt with?
5. Where will they be deployed? And for what purpose?

Why is China now being positioned as a global threat? Yes, it has built some air bases on islands in the Pacific. But the US has over 800 military bases in 80 countries. And, yes, belt and road initiative means that it is broadening its influence throughout the world – as the US has done for the best part of the 20th and now the 21st centuries.

The US already deploys 18 Trident Subs, each armed with 196 nuclear weapons – three times the killing power of the threshold for nuclear winter. It has been estimated that the US spent \$14 trillion on wars since September 11, half of which was allocated to weapons firms, namely Lockheed Martin, Raytheon, Northrop Grumman, Boeing and General Dynamics, plus logistic firms, private security contractors and other corporate interests. So influential are these companies now in Australia that they have covered Canberra International airport with huge posters advertising their lethal wares and their buildings have

proliferated into Canberra itself.

But now that the Afghan war has finished, they need a new money spinner, and China fits the bill. Why is China now being positioned as a global

threat? Yes, it has built some air bases on islands in the Pacific. But the US has over 800 military bases in 80 countries. And, yes, belt and road initiative means that it is broadening its influence throughout the world – as the US has done for the best part of the 20th and now the 21st centuries.

This should not be a competition between rival powerful countries. Now is the time to realise that unless we move to global cooperation, this new provocative strategy could easily lead to nuclear war – as the Bulletin of the Atomic Scientists predicted this year when they placed the doomsday clock at 100 seconds to midnight, the closest it has ever been in this unstable nuclear armed world.

Source: <https://www.smh.com.au/national/morrison-makes-soothing-noises-about-nuclear-non-proliferation-but-what-of-future-governments-20210916-p58saf.html>, 16 September 2021.

OPINION – MV Ramana

Why Molten Salt Reactors are Problematic and Canada Investing in them is a Waste

One of the beneficiaries of the run-up to a potential federal election has been the nuclear energy industry, specifically companies that are touting new nuclear reactor designs called small modular reactors. The largest two financial handouts have been to two companies, both developing a specific class of these reactors, called molten salt reactors (MSRs). First, in

October 2020, Canada's minister of innovation, science and industry announced a \$20-million grant to Ontario-based Terrestrial Energy and its integral molten salt reactor (IMSR) design. In March 2021, New Brunswick-based Moltex received \$50.5 million from the Strategic Innovation Fund and Atlantic Canada Opportunities Agency.

As a physicist who has analyzed different nuclear reactor designs, including small modular reactors, I believe that molten salt reactors are unlikely to be successfully deployed anytime soon. MSR designs face difficult technical problems, and cannot be counted on to produce electricity consistently.

How they Work: Molten salt reactors use melted chemicals like lithium fluoride or magnesium chloride to remove the heat produced within the reactor. In many MSR designs, the fuel is also dissolved in a molten salt. These designs are very different from traditional reactor designs — currently, the CANDU design dominates Canada's nuclear energy landscape. CANDU uses heavy water (water with deuterium, the heavier isotope of hydrogen) to transport heat, slow down or "moderate" neutrons produced during fission, and natural uranium fabricated into solid pellets as fuel. Slower neutrons are more effective in triggering fission reactions as compared to highly energetic, or fast, neutrons.

Terrestrial's IMSR is fuelled by uranium which contains higher concentrations of uranium-235, a lighter isotope as compared to uranium found in nature (natural uranium), which is used in CANDU reactors. The enriched uranium is dissolved in a fluoride salt in the IMSR. The IMSR also uses graphite, instead of heavy water used in CANDU reactors, to moderate neutrons.

Moltex's Stable Salt Reactor (SSR), on the other hand, uses a mixture of uranium and plutonium and other elements, dissolved in a chloride salt and placed inside a solid assembly, as fuel. It does not use any material to slow down neutrons. Because of the different kinds of fuel used, these MSR designs need special facilities — not present in Canada currently — to fabricate their fuel. The enriched uranium for the IMSR must be produced using centrifuges, while the Moltex design proposes to use a special chemical process called pyroprocessing to produce the plutonium required to fuel it. Pyroprocessing is extremely costly and unreliable.

Both processes are intimately linked to the potential to make fissile materials used in nuclear weapons....

Difficult Questions: Experience with MSR designs has not been very encouraging either. All current designs draw upon the only two MSR designs ever built: the 1954 Aircraft Reactor Experiment that ran for just 100 hours and the Molten Salt Reactor Experiment that operated intermittently from 1965 to 1969. Over those four years, the latter reactor's operations were interrupted 225 times; of these, only 58 were planned. The remaining were due to various unanticipated technical problems. In other words, the reactor had to be shut down at least once every four out of five weeks — that is not what one would expect of a reliable power plant.

Even the U.S. Atomic Energy Commission that had funded the U.S. MSR program for nearly two decades raised difficult questions about the technology in a devastating 1972 report. Many of the problems identified continue to be technical challenges confronting MSR designs.

Another basic problem with MSR designs is that the materials used to manufacture the various reactor

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components will be exposed to hot salts that are chemically corrosive, while being bombarded by radioactive particles. So far, there is no material that can perform satisfactorily in such an environment. A 2018 review from the Idaho National Laboratory could only recommended that “a systematic development program be initiated” to develop new alloys that might work better... As the IRSN put it in 2015: “numerous technological challenges remain to be overcome before the construction of an MSR can be considered,” going as far as saying that it does not envision construction of such reactors “during the first half of this century.”

Problematic Solutions:

Should an MSR be built, it will also saddle society with the challenge of dealing with the radioactive waste it will produce. This is especially difficult for MSRs because the waste is in chemical forms that are “not known to occur in nature” and it is unclear “which, if any, disposal environment could accommodate this high-level waste.” The Union of Concerned Scientists has also detailed the safety and security risks associated with MSR designs.

The Liberal government’s argument for investing in molten salt reactors is that nuclear power is necessary to mitigate climate change. There are good reasons to doubt this claim. But even if one were to ignore those reasons, the problems with MSRs laid out here show that they cannot be deployed for decades. The climate crisis is far more urgent. Investing in technologies that are proven to be problematic is no way to deal with this emergency.

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PM Morrison has said the deal will comply with Australia’s international non-proliferation commitments. That’s true, as there’s a massive loophole in Article III of the NPT that exempts naval reactors from nuclear safeguards. However, the non-proliferation community has long seen the loophole as a major threat to one of the treaty’s key aims—to limit the production and use of HEU, which can be used to make nuclear weapons.

Source: <https://theconversation.com/nuclear-power-why-molten-salt-reactors-are-problematic-and-canada-investing-in-them-is-a-waste-167019>, 15 September 2021.

OPINION – Anastasia Kapetas

Limiting the Nuclear-Proliferation Blowback from the AUKUS Submarine Deal

If the architects of the AUKUS pact and its headline initiative to supply Australia with nuclear-powered submarines imagined it would be seen as proliferation neutral, the reality might not be so straightforward. The announcement was extremely sketchy on many critical details, particularly from a non-proliferation perspective.

Of course, how nuclear non-proliferation issues are addressed isn’t the sole test of this deal, but it will be part of managing its future trajectory. It’s notable that the State Department doesn’t seem to have been in the loop on negotiations. It has carriage of US non-proliferation commitments, so some of the proliferation consequences may not have been front of mind. PM Morrison has said the deal will comply

with Australia’s international non-proliferation commitments. That’s true, as there’s a massive loophole in Article III of the NPT that exempts naval reactors from nuclear safeguards. However, the non-proliferation community has long seen the loophole as a major threat to one of the treaty’s key aims—to limit the production and use of HEU, which can be used to make nuclear weapons.

Morrison’s statement is less certain when it comes

to transfers of Tomahawk cruise missiles to the Royal Australian Navy's Hobart-class destroyers and Australia's commitments under the Missile Technology and Control Regime. This non-treaty association of states aims to limit the risks of nuclear proliferation arising from the sale and transfer of nuclear-capable delivery systems. In the past, the US has backed the MTCR with stringent sanctions for non-compliance.

The last time a country transferred missiles with a range of more than 600 kilometres to another country (not counting US sales of Polaris, Trident and Tomahawk missiles to the UK) was in 1988 when China sold 3,000-kilometre-range missiles to the Saudis. The backlash was immediate and helped consolidate MTCR norms. The Tomahawk family of missiles has at least a 1,000-kilometre range and can be configured for either a nuclear or conventional payload. Some analysts suggest that the transfer of Tomahawks to Australia may erode the MTCR norm of denying transfers of missiles with ranges over 300 kilometres.

There could also be implications for negotiations on the proposed fissile material cut-off treaty, historically supported by Australia, which aims to strictly limit the amount of fissile material that nuclear-weapon states can manufacture. Negotiations are locked in a stalemate, largely thanks to Pakistan. Nonetheless, the treaty's goals have broad international support and the manufacture of more weapons-grade uranium to power Australia's submarines will likely also set those goals back.

There seems to be an emerging consensus in the global arms-control community that the AUKUS submarine deal could have a hugely negative effect on non-proliferation norms and practices.... Hans Kristensen, director of the Nuclear Information Project at the Federation of American

Scientists, says that the deal 'will further intensify the arms race in the region and dynamics that fuel military competition'. Pointing to the sparse strategic rationale offered so far, he adds, 'Other than fielding more and better weapons, does anyone have a plan?' Similar views have rippled across non-proliferation and arms-control circles, driven by fears that the deal will set a precedent ushering in a dangerous era of loosened nuclear restraints. Daryl Kimball, director of the Arms Control Association, points out that if Australia gets a HEU submarine like the US Virginia class, it will be the first non-nuclear-weapon state to have such a capability.

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What will Washington say to other allies, such as Israel, that might want the same technology? What normative leverage will the US have if China and Russia decide to proliferate naval reactor technology and long-range nuclear-capable missiles, or if other nations—let's say Jair Bolsonaro's Brazil—seize

on this precedent as an excuse to develop HEU for naval purposes?

Others have pointed out that the deal could be inconsistent with the US–Australia 123 agreement on nuclear transfers, as well as the US Nuclear Non-proliferation Act and Atomic Energy Act. If that proves correct, there'll need to be a legislative component to make the deal legal from the US side. All of this depends on the nature of the technology transfer on naval reactor design and HEU enrichment—whether it's a 'black box', with no Australian involvement in the nuclear side of the submarine project, or if Australia will have to develop some capability on reactor repair, fuel manufacture, storage and refuelling to accommodate a wartime scenario where total dependence on the US might not be feasible. In either case, Australia will probably need to modify its safeguard agreements with the International Atomic Energy Agency, given all the questions this deal raises about how the American HEU nuclear fuel cycle will extend to Australia.

Australia has said that it doesn't want to develop either nuclear weapons or an indigenous nuclear fuel cycle, but other countries will be asking whether that will remain true over time. Verbal assurances won't be enough, argues Kimball. He and other arms-control advocates suggest that the US needs to develop legislation ensuring that Australia won't use this agreement to develop an indigenous enrichment capability. The non-proliferation community, and other nations, could decide to lobby for another legislative requirement—that the Australian naval reactors be designed for LEU rather than HEU. HEU is anything above 20% enrichment, but US naval reactors on submarines and aircraft carriers use fuel that is 93–97% enriched weapons-grade uranium.

Transferring HEU technology to a non-nuclear-weapon state is seen as a grave proliferation risk, because it could enable that state to move closer to a nuclear weapons breakout capability without penalty and because it increases the risk of nuclear theft by non-state actors for use in a basic gun-type nuclear device. The international community went through this issue with Brazil from the late 1970s, when the military junta developed HEU for use in naval reactors, and probably for nuclear weapons. After sanctions and the signing of a special Brazil–Argentina nuclear non-proliferation agreement, Brazil has been developing nuclear-powered submarines with France, which are believed to be LEU fuelled.

There's been a push in the US Congress to phase out HEU in US naval reactors, consistent with domestic legislation on non-proliferation and Washington's international non-proliferation commitments. In 2020, the House Armed Services

Committee, controlled by the Democrats, called for continued study into the use of LEU in the next generation of US submarines. The Republican-controlled Senate Armed Services Committee disagreed and recommended banning the use of public funds to explore the option. It cited a 2016 JASON defence advisory panel report which found that the use of LEU reactors wasn't feasible in current submarine designs. Using LEU requires bigger reactors as around 4.7% more enriched uranium is needed than for HEU. Submarines using LEU must be refuelled every one to three years. The Virginia-class HEU fuel lasts for 33 years—the life of the submarine. But the JASON report also recommends a compromise, using what it calls LEU+. This is 25% enriched uranium, technically HEU but well below the enrichment level needed for nuclear weapons. It would provide roughly the

same performance as higher enriched HEU. The first opportunity to use LEU or LEU+ would be in the Virginia class's replacement, the SSN(X) or Improved Virginia class, to be designed before 2030.

There are many reasons Australia might want to explore LEU+ as well as working towards best-

practice nuclear safeguards. A deal that was meant to demonstrate unified resolve to China has generated considerable blowback, opening up divisions in NATO and the Five Eyes and generating distrust of Australia's motives—all of which adversaries will be quick to exploit. Working to ameliorate the non-proliferation harms of this deal could help manage some of these effects.

And continuing to discourage a proliferation-permissive environment by upholding global rules is definitely in Australia's interest, especially in a geopolitical environment where potential

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A deal that was meant to demonstrate unified resolve to China has generated considerable blowback, opening up divisions in NATO and the Five Eyes and generating distrust of Australia's motives—all of which adversaries will be quick to exploit. Working to ameliorate the non-proliferation harms of this deal could help manage some of these effects.

adversaries are fielding ever-increasing numbers of weapons. The US and Australia both recognise the importance of strengthening global rules and the institutions that allow existential nuclear-proliferation issues to be mediated. Conventional nuclear and military deterrence might make state adversaries think twice before using nuclear weapons, but it's of little use in stopping acquisition and the attendant risks of catastrophic miscalculation.

Source: <https://www.aspistrategist.org.au/limiting-the-nuclear-proliferation-blowback-from-the-aukus-submarine-deal/>, 21 September 2021.

OPINION – Mitch Shin

What Do North Korea's Latest Missile Launches Mean?

Since its unusual military parade on September 9, which did not put on display any new weapons systems, North Korea has tested both cruise and ballistic missiles. Experts have offered a variety of theories to explain the move. Some analysts argued that the North has decided to further strengthen its self-defense capabilities to counter the US effectively, indicating that renewed dialogue between the US and North Korea is unlikely to happen in the near future. Others make the opposite argument, predicting that bilateral or multilateral negotiations on denuclearization will take place soon, considering the diplomatic efforts made by neighboring countries in Tokyo and Seoul.

In order to understand the motivation of the North's missile launches, however, we only need to know one thing: Pyongyang is intent on developing its missile program to enhance national security. Last week's missile launches have no secret motivation underneath the surface. They are exactly what

they appear to be: weapons tests designed to further the North's military capabilities.

Some have expressed concerns over the frequency of the North's missile launches, but it was predictable based on Kim's previous comments. North Korean leader Kim announced his intention to develop more weapons and increase the country's military capabilities vis-à-vis the U.S. and South Korea at the Workers' Party Eighth Congress in January. As the 1950-1953 Korean War is still technically underway – the combatant countries have not declared the end of the war yet, only a truce – it is natural for the North and the South to continue to develop more advanced weapons. The two Koreas have kicked

off their own arms race by introducing new and advanced weapons, especially after the U.S. lifted missile restrictions on South Korea. Meanwhile, the diplomatic options for tackling North Korea's growing nuclear power are narrowing.

It is believed that, at the ill-fated summit in Hanoi, Kim demanded U.S. President Donald Trump publicly recognize North Korea as a nuclear state. This is a non-starter for Washington, as the U.S. has sought "complete, verifiable, irreversible denuclearization" on the Korean Peninsula under

a series of administrations. Since the Hanoi summit in 2019, Pyongyang has been crystal clear that it will never come back to the negotiating table unless Washington removes its so-called "hostile policies" first, which broadly refer to the devastating economic sanctions and the US

military presence on South Korean soil. That said North Korea has always left room for potential negotiations by avoiding crossing the US "red lines" of ICBM or nuclear tests...

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True, the long-range cruise missiles and train-launched ballistic missiles that were tested in the past 10 days could pose a serious threat to the security of the U.S. and neighboring countries. However, it is important that North Korea has refrained from the ultimate provocations – ICBM or nuclear tests – even though Kim said he would no longer be bound by his country’s self-imposed moratorium on such tests in the wake of the failed Hanoi summit.

The former Obama and Trump administrations took different approaches toward North Korea but there were no significant changes in the main demand: the total denuclearization of the North. But in practice, Washington has never ranked the denuclearization of North Korea as its top priority. The Obama administration’s “strategic patience” approach, for example, effectively allowed the North to keep developing its nuclear and missile programs under the economic aegis of China and Russia. The Trump administration’s “top-down” approach, by contrast, was an audacious move to directly tackle the denuclearization of the North. Before Donald Trump, no U.S. president had ever considered sitting down with the North Korean leader to discuss the issue. However, Trump’s approach was ill-suited to a substantive and irreversible outcome, as no agreements or agendas were discussed by working-level officials between the two countries before the summit was held.

Since President Biden took office in January, North Korea has not sought to renew dialogue with the US. The country tested short-range ballistic missiles in March, but there were no serious countermeasures taken by the US at the time. Since

then, the country has consistently tested more missiles, but these tests were considered just “business as usual” by Washington and Seoul. At the moment, Washington takes the rise of China in the region more seriously than the North’s longstanding nuclear threat. However, the US will ultimately need to cooperate with China to address the North’s growing nuclear capabilities. “For China, it would be good to have North Korea to agree to denuclearization, even if it is unlikely this will happen,” said Ramon Pacheco Pardo, professor of international relations at King’s College London, in an interview with *The Diplomat*. “It would defuse tensions in one of China’s borders, which Beijing would welcome.” ...

North Korea will never take steps toward denuclearization first. In the same context, the US will not lift economic sanctions first to entice the North to dismantle its nuclear sites and give up its nuclear weapons. There will never be a perfect tit-for-tat approach that leads to the full denuclearization of North Korea.

approach that leads to the full denuclearization of North Korea. But there is one way that both countries can move forward from their stalled talks and outdated political games: a long-term, phased denuclearization process overseen by multilateral cooperation. If the North’s missile tests are “business as usual,” there is no reason to hesitate to initiate such cooperation. Doing so could prevent the Korean Peninsula from becoming the next arena of the Cold War. Time is on North Korea’s side if the U.S. keeps hesitating to take bold steps toward a realistic denuclearization process on the Korean Peninsula.

Source: <https://thediplomat.com/2021/09/what-do-north-koreas-latest-missile-launches-mean/>, 20 September 2021.

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OPINION – Manpreet Sethi

North Korea’s Missile Missives: Is President Biden Listening?

President Biden’s administration concluded its North Korea policy review in May 2021. It recommended a calibrated, practical approach towards Pyongyang—somewhere between a grand bargain and strategic patience. However, since then, many other issues have kept the US preoccupied: COVID, China, Afghanistan, and climate change, to name but a few. North Korea would have been waiting its turn in the midst of all this, but its patience seems to be running out.

Over the past few months, new developments out of Pyongyang would have undoubtedly caught the US’ attention. In August, the IAEA reported a resumption of North Korea’s Yongbyon plutonium producing nuclear reactor. In September, the country has tested not one, but two nuclear capable missiles, with both displaying new kinds of capabilities. These tests can be interpreted as missile missives to President Biden in the hope of drawing him into some engagement with Pyongyang. They also allow North Korea to arm itself with a set of leverages in preparation for any talks that the US may offer. Interestingly, in June 2021, Kim Jong-un had said that he was preparing his country for “both dialogue and confrontation” with the US.

On 15 September—the day AUKUS, or the US-UK-Australia security pact, was announced—North Korea conducted the maiden test of a rail-mobile ballistic missile. Pyongyang released photos that showed the launch vehicle parked near a tunnel

opening out from a mountain. Earlier in the week, on 13 September, they had test-launched a cruise missile that flew 1500 km. Other technical details have not been revealed. Chairman Kim Jong-un had dropped a hint about this ‘strategic weapon’ in his January 2021 address to the Party Congress. In fact, North Korea’s efforts to miniaturise warheads have been reported by the UN Panel of Experts since August 2020.

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While North Korea has undertaken tests of SLBM in the past, it does not yet possess such a submarine. Rumours are that one such vessel is under construction. Efforts towards this capability may accelerate after the South Korean SLBM

test that took place on the same day as North Korea’s rail-mobile missile launch. Both countries continue to paint the other’s moves as provocation, and describe their own as necessary for self-defence.

The testing of these two new technologies appears to be part of North Korea’s effort to enhance its nuclear arsenal’s survivability. This is not surprising. Given its threat perception from the US, which has vastly superior military capability, Pyongyang obviously seeks to ensure that the US will not be able to annihilate its retaliatory capability with any kind of a first strike. Tunnels in

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mountains, mobility, dispersal across platforms, and deception are part of this exercise. Multiple launch platforms would also provide the facility to launch from many sites. According to the Korean Central News Agency (KCNA), a North Korean official was quoted as describing the test by the Railway Mobile Missile Regiment as “an intensive

blow to the menacing forces in many places at the same time.”

Still, there are questions about the efficiency and reliability of North Korea's launch platforms. For instance, several American analysts have been dismissive of the North Korean rail system, which is believed to be neither extensive nor modern. Unfortunately, given how closed North Korea is to the rest of the world, it is difficult to gauge the actual worth of its rail network. The fact that the

country's leadership has used it to visit China should however provide some indication of its reliability. Meanwhile, missile mobility via roads has also been questioned, given that Pyongyang's large missiles have been seen on transporter erector launchers with as many as 22 wheels. This indicates manoeuvring difficulties on less than high-quality roads. These assertions are backed by US confidence in its advanced ISR capabilities, which are expected to detect and monitor missile movements in North Korea.

The point being made by North Korea's capability demonstrations however is that it can complicate US targeting strategy. The idea is to create uncertainty about whether a decimation of North Korean nuclear capability is achievable; and if any attack on it would be a one-sided affair, as it was in the case of Hiroshima and Nagasaki. For the purpose of deterrence, even the suggestion of retaliation should suffice. Taken together, North Korea's messages through the new launch platforms can mitigate their individual vulnerabilities and credibly signal deterrence.

Provocations are a good way to get attention but they need to be played smartly. Too little, and they are dismissed as business as usual. Too much, and they may lead to a hardening of

positions. North Korea appears to be carefully calibrating its missiles by conducting cruise missile tests that are not prohibited under UNSC Resolutions, and those of short-range ballistic missiles. The US will have to calibrate its own response to deal with the reality of a nuclear North Korea. The delay only allows Pyongyang more time to build/improve its capability, pushing denuclearisation even further. A verifiable freeze on the programme in exchange for some concessions will probably have to be the starting point.

Verifications will also be most useful to not only arrest North Korea's expanding nuclear and missile capability, but also to minimise the risk of illegal proliferation/pilferage of material or technology to/by other state or non-state actors. The victory of the Taliban in Afghanistan has reinvigorated terrorist organisations across the world, and some of them might have an interest in raising the bar with acts of radiological or nuclear

terrorism. A cash-strapped and isolated nuclear North Korea may seem like the obvious place to go. It is necessary to steadily bring Pyongyang into the nuclear security architecture, and for this, it may be time for President Biden to pay heed to their missile missiles.

Source: http://www.ipcs.org/comm_select.php?articleNo=5788, 29 September 2021.

OPINION – Walter Pincus

Nuclear Weapons, Deterrence and what's Next

"Right now, we can hold any target on the planet at risk today. We do. And we do that every day, and everybody knows it. That's the nuclear weapons that are deployed every day. The adversaries that we face cannot do anything about

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those nuclear weapons and so that holds everything at risk." That's Vice Chairman of the Joint Chiefs of Staff Gen. John Hyten, speaking...with the Brookings Institution's specialist in defense strategy, Michael O'Hanlon. Hyten, a former head of STRATCOM who is set to retire soon, followed up with the downside of the U.S. position saying, "But if your only ability to hold a target at risk is a nuclear weapon, that is a bad place to be. That is a really bad place to be because that runs the risk of an escalation in a war that we don't want to risk."

Hyten then shared an anecdote, saying that as STRATCOM Commander, after he first briefed now-Joint Chiefs Chairman Gen. Mark Milley for an hour on the complexities of the U.S. strategic nuclear weapons program, Milley asked for an explanation "in simple English. 'Why do we have nuclear weapons?' My answer," Hyten said, "was one sentence – to keep people from using nuclear weapons on us."

Right there, he expressed what I believe is the nuclear weapons dilemma – they may be unusable – but nonetheless, the U.S. has programs underway to keep the current force for another 40 years. A reminder: The U.S. has some 1,400 or so nuclear warheads currently deployed. The U.S. Government has been spending hundreds of billions updating warheads, thinking of new ones, and is already on the way to replacing all three delivery systems of the nuclear Triad – new strategic submarines, strategic bombers and ground-based ICBMs.

Hyten also had this answer to the nuclear weapons dilemma. "You don't want your only capability to be the capability that would cause an escalation into nuclear conflict," he said, "that's why we need hypersonic capabilities." Yes, the U.S. must continue to upgrade its nuclear weapons, the delivery systems and the nationwide weapons building complex that keeps it all going, but at the same time, Hyten said, "The real requirement is conventional prompt strike – that's the real requirement [to] conventionally hold targets at risk

anywhere. Hypersonics happen to be one of the solutions to do that. But cruise missiles can do that. Other capabilities can do that as well. We need a mix of capabilities to do that." So, the future, as Hyten sees it, is that the U.S. needs to be able to promptly strike targets worldwide, not just with nuclear weapons but with conventional weapons as well...

Hyten then shared what he thought was the lesson from that Cold War experience. "So, when you look at great powers," he said, "our goal should be to never go to war with China, to never go to war with Russia, because that day is a horrible day for the planet, a horrible day for our countries. It wrecks the world; it wrecks the world's economy. It's bad for everybody. So, we

have to make sure we don't go down that path." However, eight minutes later, Hyten said, "The specific capabilities that worry me about China are not the capabilities about the future of Taiwan, it's the almost unprecedented (Chinese) nuclear modernization that is now becoming public."

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Remember, for years, China has practiced what it calls "minimum deterrence," with the Pentagon saying last year that as of the end of 2019, "The number of warheads on the PRC's land-based ICBMs capable of threatening the US is expected to grow roughly 200 in the next five years." Now, Hyten said, "It seems like every couple of weeks new pictures of more silos (in China) were coming in. And, oh, by the way, there's no limits on what China can put in those silos. So, we're limited [by treaty] with Russia to 1,550 deployed nuclear weapons. So, we have to decide where we want to put those -- submarines, ICBMs. Bombers are counted a little bit differently under that treaty, but that puts a limit on what we have. China, there's no limit. They could put, you know, 10 re-entry vehicles on every one of those ICBMs if they wanted to. There's nothing to limit that ability." ...

I question Hyten's enormous concern about China's nuclear program. True, China is engaged in a major nuclear buildup that includes moving toward a Triad of nuclear delivery systems – but that is something the U.S. has had for almost 50 years. And, as pointed out above, the U.S. is modernizing its nuclear force to last another 40 years. Beijing's construction of missile silos, which may top 400, doesn't mean each will contain an ICBM. The U.S., by the way, has 450 ICBM silos, 400 of which hold ICBMs, while missiles for the empty ones are in storage....

Hyten said at Brookings, "We're having strategic stability talks with Russia to make sure we understand where they are, not just in the nuclear realm but in space as well. We need to have that conversation start as well with the Chinese. We really do.... As different as we are, we do have a fundamental common goal and that is to never go to war with each other because war with a nuclear power is a bad thing." ...

Source: https://www.thecipherbrief.com/column_article/nuclear-weapons-deterrence-and-whats-next, 21 September 2021.

OPINION – William Lambers

It's Time for the US to Ratify the Nuke Test Ban Treaty

It was 25 years ago on 24 September 1996 when the CTBT was opened for signature at the UN. President Clinton signed the treaty for the US, the product of many years of work from both Democrat and Republican presidents. The CTBT bans all nuclear test explosions but has not taken effect

yet because of eight holdout nations (U.S., China, North Korea, Iran, Israel, Egypt, India, Pakistan). But the US Senate still has not ratified the treaty.

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Although the U.S. has not test exploded a nuclear weapon since that time, the failure to approve the treaty has left the door open for a resumption of tests. Only North Korea has tested a nuclear weapon in the last two decades. But how long will a general moratorium continue? As Daryl Kimball of the Arms Control Association warns, "We cannot afford to take the non-testing norm for granted." Without U.S. treaty approval, other nuclear states like China, India and Pakistan are not likely to ratify.

The US Senate still has not ratified the treaty. Although the U.S. has not test exploded a nuclear weapon since that time, the failure to approve the treaty has left the door open for a resumption of tests. Only North Korea has tested a nuclear weapon in the last two decades. But how long will a general moratorium continue.

The major benefit of the CTBT was to create the conditions where deeper nuclear arms cuts could take place. There has not been much progress on nuclear disarmament in recent decades. The US and Russia signed treaties in 2002 and 2010 to reduce nuclear arms but still thousands of weapons on each side remain. Other nuclear states have been building up arsenals and modernizing. There is an increasing risk of a dangerous arms race between the U.S. and China. This is even more reason for both nations to finally ratify the CTBT. It would be a disaster if China or the U.S. started test exploding nuclear weapons again. Neither country has test exploded a nuke since the 1990s. The US and China should reach ratify the CTBT without delay. This would be an important psychological step for each nation to shut the door on nuclear testing forever, instead of just a fragile moratorium that could be broken at any minute. It could open the door for more agreements on nukes.

Each nation has much to gain in stopping an arms race. Neither China nor the US can afford to divert precious resources towards nukes, especially with pressing needs at home and other international priorities. Most importantly cooperation on the CTBT can set the foundation for serious disarmament talks. This could involve the US, China and Russia as well as other nuclear powers. According to the Arms Control Association the US and Russia each have thousands of nuclear warheads still active and China is around 300. The three nations account for well over 90 percent of nuclear weapons worldwide.

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In addition, China's ratification of the CTBT might be the only thing that can get North Korea to end its nuke testing program. North Korea has conducted six nuclear tests since 2006 and we certainly don't want to see any more. China, its ally and neighbor, might be the only influence strong enough to get North Korea to ratify the treaty. Twenty-five years is a long enough wait. Republicans and Democrats need to demonstrate leadership and get the CTBT ratified. We need this step toward peace.

Australia has announced the most significant change in its defence and strategic direction in decades – a plan to make the Navy's next submarine fleet nuclear-powered.

Source: <https://www.pennlive.com/opinion/2021/09/its-time-for-the-united-states-to-ratify-the-uke-test-ban-treaty-opinion.html>, 25 September 2021.

OPINION – Henry Belot

Why Australia is Teaming up with the US and UK to Build Nuclear-Powered Submarines

Australia has announced the most significant change in its defence and strategic direction in decades – a plan to make the Navy's next submarine fleet nuclear-powered. It means a \$90 billion program to build 12 French-designed diesel-powered submarines will now be scrapped,

prompting many to ask – why are we doing this? There are many factors behind this decision, and many questions about what this means for Australia. Let's start by looking at the strategic advantages.

Silence is Golden: Nuclear-powered submarines can stay quieter for longer. To put it simply, nuclear-powered submarines are often quieter than diesel-powered alternatives. There are exceptions to this rule, particularly when subs are running on electricity, but stealth has been listed by the PM and the Opposition

Leader as a key reason for this deal with the US and the UK. They have become so quiet that in 2009, British and French nuclear ballistic missile submarines reportedly collided in the Atlantic Ocean, unaware of each other's presence.

Diesel generators can make a lot of noise when travelling on the water's surface and many older models require a snorkel for air intake. That makes them more easily detected. More modern diesel-electric subs do not need to surface as often, but time underwater is limited by battery power and fuel load. Again, the

ability to stay underwater for longer is one reason Australia has switched to the nuclear-powered alternative. The subs can go quiet once they are submerged and switched to electric power, but this requires batteries to be charged and limits the total time spent underwater.

Horses for courses: Another advantage is nuclear-powered submarines can go faster, and stay underwater for longer. But they are often bigger in size, which makes them less nimble in shallow coastal waters. So, there are strategic advantages and disadvantages. Nuclear-powered submarines would allow the Australian Navy to patrol more of the Indo-Pacific region for longer, which could be particularly handy at a time of competing

territorial claims for strategic waters. This could be done to deliberately make Australia's presence known near, or in, regions like the South China Sea, or in stealth mode. But diesel or electric-powered submarines excel in coastal waters like those to the north and north-west of Australia... According to many analysts, they are better suited to defending coastlines or ports if invaded.

Who Wins the Race? This one is easy. It's the nuclear-powered alternative. There are numerous reports they can reach speeds of 55 kilometres per hour or more when submerged. This is significantly faster than diesel/electric capacity. This is important when patrolling open oceans, but less important when operating close to a coast.

Who's Got What? China already has nuclear-powered submarines, and this switch of strategy would see Australia match – or come close to – its capabilities. China has six Shang-class nuclear-powered attack submarines. Each one is 110 metres long and capable of carrying cruise missiles and torpedoes. But it also has 50 diesel/electric attack submarines, making its submarine fleet significantly larger than Australia's. Some naval experts predict China's fleet will soon be larger than that of the US. Nuclear-powered submarines are also common among other major global powers. As well as the US and China, Russia, France, the UK and India, all have them. What makes Australia different to all these nations is the absence of a domestic nuclear industry capable of supporting the submarines. And unlike these other nations, Australia also does not have nuclear weapons capacity....

What Happens to the Nuclear Fuel? The details on this are unclear, despite it being one of the key questions. Given Australia would likely obtain the

fuel from another nation, any waste could be returned to them, or it could be stored in Australia. The waste could be sent to a proposed facility in South Australia. Another issue is what happens if there is a breach on a sub, or if there are nuclear material leaks. Again, answers to this are still unclear.

Source: <https://www.abc.net.au/news/2021-09-16/why-australia-wants-nuclear-submarines/100466204>, 16 September 2021.

NUCLEAR STRATEGY

CHINA

China 'Uninterested' in Nuclear Non-Proliferation: Sen. King

Nuclear-powered submarines would allow the Australian Navy to patrol more of the Indo-Pacific region for longer, which could be particularly handy at a time of competing territorial claims for strategic waters. This could be done to deliberately make Australia's presence known near, or in, regions like the South China Sea, or in stealth mode.

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The CCP is rapidly pursuing nuclear armament across the board and seems reluctant to enter into any sort of arms control agreement such as the one the US previously maintained with the Soviet Union, according to Sen. Angus King (I-Maine) ... King further stated that the CCP was likely attempting to reach full parity with the US in terms of its number of nuclear weapons and their capabilities.... King said that the US still relies on a broad strategy of deterrence, whereby the threat of force is intended to prevent the use of force by an adversary.... Despite the previous success of this strategy, however, King suggested that not enough had been done to adequately distinguish the many differences between Russia and China, and to account for the fact that the CCP is a fundamentally different kind of threat than what the USSR was during the Cold War....

King, who wrote his senior college thesis on the strategy of deterrence in 1966, articulated that a key difference in the strategic landscape between

the Cold War and the present was that the fact that the world is no longer a bipolar political landscape, locked in a struggle between two great powers. Rather, he said, the world is entering a multipolar world that presents more complexity and novel scenarios in terms of international strategy.... To this end, King said that the most immediate external threat to the US' ability to meaningfully pursue deterrence was the possibility of a cyberattack intended to interfere with U.S. command and control, those capabilities concerned with overseeing and facilitating military operations.

To that end, King argued that the US needs to develop better redundancies, that is, systems and processes that guarantee a military technology can effectively operate even if another, similar technology fails. King further mused that a foreign government could likely hire some 8,000 hackers for the cost of a single fighter jet, and that the low barrier to entry for cyberwarfare essentially guarantees that the next war will begin in cyberspace....

Source: https://www.theepochtimes.com/china-uninterested-in-nuclear-non-proliferation-sen-king_4009064.html, 21 September 2021.

SOUTH KOREA

Nuclear Weapons No Real Advantage for South Korea, Former USFK Commander Says

A retired Army general who oversaw all U.S. troops on the Korean Peninsula said he believed nuclear weapons would not give South Korea a strategic advantage and may instead escalate tensions to "an unnecessary degree of danger." Vincent Brooks, the former commander of U.S. Forces Korea and United Nations Command, spoke during a virtual roundtable discussion hosted by the

Korea Defense Veterans Association. He described South Korea as a "mature democracy" that had "withstood great pressures and tests," but possessing a nuclear weapon would not help it deter threats from North Korea. In light of North Korea's ongoing nuclear program, the subject of Seoul possessing nuclear weapons has been raised by many South Korean politicians in recent years, including primary candidates in the upcoming presidential election.

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President Moon has ruled out the deployment of nuclear weapons in South Korea, warning during a television interview in 2017 that it may "lead to a nuclear arms race" in the region. "I'm of the view that South Korea and the alliance have the advantage," Brooks said. "They have the military advantage and the addition of nuclear weapons ... does not help that." ... South Korea does not possess nuclear weapons but has made advances in developing its missile program. On 8 September 2021, it became one of the few nations to successfully test-fire a submarine-launched ballistic missile, an accomplishment Moon described as a deterrent to North Korea's continued provocations.

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In addition to its technological advances, decades-old guidelines limiting the range of South Korean-developed ballistic missiles to a maximum range of roughly 500 miles were scrapped by the U.S.

and Seoul in May. Given these advances, Brooks said, he believed the idea of South Korea possessing nuclear weapons "escalates the threshold to one that is an unnecessary degree of danger." ...The 42-year Army veteran said Seoul "should be very careful not to open the door to these types of things when they have strength already; and not to do it just to be equalizing" against Pyongyang....

Source: <https://www.stripes.com/branches/army/>

[2021-09-16/south-korea-nuclear-weapons-north-korea-brooks-2907366.html](https://www.theweek.in/news/india/2021/09/16/south-korea-nuclear-weapons-north-korea-brooks-2907366.html), 16 September 2021.

BALLISTIC MISSILE DEFENCE

INDIA

India Seen as Prospective Buyer of Russian Missile System that can Hit Satellites

Russian Deputy PM Borisov on September 16, 2021, announced the country's armed forces had begun induction of the S-500 surface-to-air missile system. The S-500 is capable of intercepting stealth aircraft, long-range

ballistic missiles and hypersonic cruise missiles. It uses a number of different surface-to-air missiles. The S-500 is intended to be complementary to the S-400 missile defence system. While the S-400 is primarily meant to shoot down a range of aerial targets like aircraft and cruise missiles, the S-500 can destroy ballistic missiles, which are much faster and need to be shot down at significantly higher altitudes. Analysts claim the S-500 could even target satellites in low-earth orbit.

Borisov told Interfax news agency he considered India to be the first prospective buyer for the S-500 system. "Potentially, yes (India buying the S-500). I will tell you this: India is the largest exporter of Russian weapons, and we sometimes sell to India what we don't sell to other

countries."... He added there were no agreements with India on the S-500, yet. According to the Missile Threat database of the CSIS, one of the missiles used in the S-500 system can hit targets up to 600km away. US intelligence claimed a test of the S-500 in 2018 struck a target 299 miles (around 480km) away, which was believed to be the longest range demonstrated by a surface-to-air missile.

The DRDO has been working on a ballistic missile

defence system for India for a decade, which has been reported to be ready for induction. India is also due to take delivery of its first S-400 missiles towards the end of this year. Analysts have suggested the S-500 would be a key part of Russia's 'anti access/area denial (A2AD)' strategy of preventing enemies from controlling airspace or territory by shooting down airborne systems such as airborne early warning aircraft, which are meant to operate away from conflict zones....

Source: <https://www.theweek.in/news/india/2021/09/17/india-seen-as-prospective-buyer-of-russian-missile-system-that-can-hit-satellites.html>, 17 September 2021.

While the S-400 is primarily meant to shoot down a range of aerial targets like aircraft and cruise missiles, the S-500 can destroy ballistic missiles, which are much faster and need to be shot down at significantly higher altitudes. Analysts claim the S-500 could even target satellites in low-earth orbit.

RUSSIA

Russia Begins Rollout of New S-500 Air Defence System

Russia has completed tests of its new S-500 surface-to-air missile system and has started supplying it to the armed forces.... The S-500, a weapon Moscow hopes will beef up its own defences and become an export best seller, has

been described as a space defence system and can intercept intercontinental ballistic missiles, hypersonic cruise missiles and aircraft. Russia started testing the system in 2020 and the military have said that the first batch would be deployed around the city of Moscow....

Source: <https://www.reuters.com/world/europe/russia-begins-rollout-new-s-500-air-defence-system-report-2021-09-16/>, 16 September 2021

Borisov told Interfax news agency he considered India to be the first prospective buyer for the S-500 system. "Potentially, yes (India buying the S-500). I will tell you this: India is the largest exporter of Russian weapons, and we sometimes sell to India what we don't sell to other countries."

USA

US MDA Test Launches Upgraded Homeland Missile Defense

The US MDA revealed it has test-launched a kill vehicle mock-up with curtailed boosting stages for

earlier release. The maiden launch in two stages of the three-stage Ground-Based Midcourse Defense (GMD) Ground-Based Interceptor (GBI) kill vehicle allowed greater time and space for interception.

Greater Flexibility in Missile Defense:

"This new capability is known as a 2-/3-Stage selectable GBI. This capability gives the warfighter greater flexibility in executing the defense of the homeland while significantly increasing the battlespace for successful threat engagement". MDA Director Vice Admiral Hill remarked: "The system worked exactly as it was designed to do, and the results of this test provide evidence of the greatly increased battlespace the selectable booster brings to the Warfighter. "The Ground-Based Midcourse Defense system is vitally important to the defense of our homeland, and this test demonstrates that we continue to provide enhanced capabilities for our existing Ground-Based Interceptor fleet while we rapidly design and deliver the leap-ahead technology of the Next Generation Interceptor."

Source: <https://www.thedefensepost.com/2021/09/23/homeland-missile-defense-test/>, 23 September 2021.

USA-ISRAEL

US House Approves \$1 bn to Resupply Iron Dome

US lawmakers green-lit \$1 billion to resupply Israel's Iron Dome missile defense system after funding was controversially stripped from a separate Bill following a revolt from the Democrats' left flank. The money had originally been included in legislation addressing a looming government shutdown and a potential October debt crisis. But a group of progressives in the Democrat-controlled House of Representatives said they would tank that unless

US lawmakers green-lit \$1 billion to resupply Israel's Iron Dome missile defense system after funding was controversially stripped from a separate Bill following a revolt from the Democrats' left flank. The money had originally been included in legislation addressing a looming government shutdown and a potential October debt crisis.

Iron Dome funding was yanked from the wording. The cash transfer ultimately advanced from the House on a comfortable 420-9 vote....

'Vital to US Security':

"Assistance to Israel is vital, because Israel's security is an imperative for America's security," Ms. Pelosi said. Iron Dome has destroyed thousands of short-range rockets and shells launched by Hamas militants. The system has been backed by the US since

it was launched a decade ago to the tune of \$1.6 billion.

Source: <https://www.thehindu.com/news/international/us-house-approves-1-bn-to-resupply-iron-dome/article36659151.ece>, 24 September 2021.

EMERGING TECHNOLOGIES AND DETERRENCE

GENERAL

An Experimental Loop for Simulating Nuclear Reactors in Space

Nuclear thermal propulsion, which uses heat from nuclear reactions as fuel, could be used one day in human spaceflight, possibly even for missions to Mars. Its development, however, poses a challenge. The materials used must be able to

Nuclear thermal propulsion, which uses heat from nuclear reactions as fuel, could be used one day in human spaceflight, possibly even for missions to Mars. Its development, however, poses a challenge. The materials used must be able to withstand high heat and bombardment of high-energy particles on a regular basis.

withstand high heat and bombardment of high-energy particles on a regular basis. Will Seabright, a nuclear engineering doctoral student at Penn State, is contributing to research that could make these advancements more feasible. He published findings from a preliminary design simulation in Fusion

Science and Technology, a publication of the American Nuclear Society.

To better investigate nuclear thermal propulsion, Seairight simulated a small-scale laboratory

experiment known as a hydrogen test loop. The setup mimics a reactor's operation in space, where flowing hydrogen travels through/ the core and propels the rocket — at temperatures up to nearly 2,200 degrees Fahrenheit. Searight developed the simulation using dimensions from detailed drawings of tie tubes, the components that make up much of the test loop through which hydrogen flows. Industry partner Ultra Safe Nuclear Corporation (USNC) provided the drawings....

Searight found that while consistent heating of hydrogen to 2,200 degrees Fahrenheit was possible, it was necessary to include a heating element directly above the test section to prevent a reduction in heating. Data collected from the modelling software showed that the flow of hydrogen through the test section was smooth and uniform, reducing uneven distribution of heat through the loop that could jeopardize the setup's safety and lifespan. Analysis of the results also verified that stainless steel would allow for more convenient and cost-effective construction of the loop....

Source: <https://news.psu.edu/story/669960/2021/09/21/research/experimental-loop-simulating-nuclear-reactors-space>, 21 September 2021.

Digitalization Supports Safe and Effective Nuclear Facility Decommissioning

Digitalization plays an important role in advancing nuclear decommissioning projects by enabling experts to improve their planning and implementation. An event held on the side lines of the 65th IAEA General Conference highlighted the practical value of 3D modelling and simulations, visualization, virtual reality, artificial intelligence, machine learning and other similar applications in the planning and implementation of nuclear decommissioning.

Although many nuclear power reactors are undergoing life extensions, considerable decommissioning work is also underway and is

expected to take place as power plants reach the end of useful and economical operations. According to IAEA projections, between 12 per cent and 25 per cent of the 2020 nuclear electrical generating capacity is expected to be retired by 2030. Effective management of decommissioning is vital to the sustainability of nuclear power. "Innovative digital technologies can provide crucial insights for the planning and implementation of decommissioning projects.

Innovative digital technologies can provide crucial insights for the planning and implementation of decommissioning projects. They can provide support in decommissioning situations that are difficult or dangerous for human workers and can help ensure that projects are executed safely and effectively.

They can provide support in decommissioning situations that are difficult or dangerous for human workers and can help ensure that projects are executed safely and effectively," Mikhail Chudakov, IAEA Deputy DG and Head of the Department of Nuclear

Energy, said in his opening remarks for the event.

Decommissioning is a multi-disciplinary process, which includes activities such as physical and radiological characterization of the site and its vicinity, and decontamination and dismantling of plant and building structures, eventually leading to the reuse of the site for some other purpose. Decommissioning may take from several years to several decades, especially in the case of deferred dismantling, and experts anticipate that digital technologies will improve planning and shorten the time period required for this complex procedure to be completed.

Digital twins of nuclear facilities, which recreate a facility's technology and structures, are increasingly used to support effective design, operation and maintenance. Digital twins can be used as "as-built records", detailing how exactly a nuclear facility was constructed and maintained during its operation, to support the planning and implementation of decommissioning. Digitization also helps to enhance safety: It enables the analysis of different dismantling scenarios in terms of radiation exposure of workers, so that the safest one can be selected. So far, a total of 189 nuclear power reactors have been shut down for decommissioning globally, with 17 of them

fully decommissioned. In addition, 130 fuel cycle facilities have been decommissioned as well as about 440 research reactors. ...

Italy's Decommissioning and Radioactive Waste Management Company (SOGIN) has used 3D models and simulations to facilitate preparation of the dismantling of different types of power reactors as well as for IT-supported management of generated waste streams. In 2019, SOGIN was designated as an IAEA Collaborating Centre, strengthening cooperation between the two organizations, including on digitalization, to promote knowledge management, knowledge transfer and training in nuclear decommissioning....

To continue the exchange of information on decommissioning, the IAEA will host the International Conference on Nuclear Decommissioning: Addressing the Past and Ensuring the Future in Vienna in May 2023. The objective of the conference is to share information on achievements, challenges and lessons learned as well as on the strategies and approaches that can enable and enhance safe, secure and cost-effective implementation of national decommissioning programmes.

Source: <https://www.iaea.org/newscenter/news/digitalization-supports-safe-and-effective-nuclear-facility-decommissioning>, 21 September 2021.

IAEA Event Showcases Progress, Innovations in Nuclear Hydrogen for a Clean Energy Transition

The potential for nuclear power to produce low-

carbon hydrogen in the global transition towards net zero emissions was examined by international experts, at an event on the sidelines of the 65th IAEA General Conference on September 21, 2021.

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The IAEA side event, Innovations in the Production and Use of Nuclear Hydrogen for a Clean Energy Transition, explored developments in the coupling of nuclear power reactors with hydrogen production plants to efficiently produce both electricity and hydrogen as a cogeneration system, as well as how energy sector

cooperation, supply chain and policy support are facilitating the progress of these projects.

"A single 1000-megawatt nuclear power reactor could produce more than 200000 tonnes of hydrogen each year to fuel more than 400 000

A single 1000-megawatt nuclear power reactor could produce more than 200000 tonnes of hydrogen each year to fuel more than 400 000 fuel cell vehicles or more than 16000 long haul fuel cell trucks," Mikhail Chudakov, IAEA Deputy DG and Head of the Department of Nuclear Energy, said in his opening remarks. "This is why nuclear hydrogen can be a game changer in the fight against climate change.

fuel cell vehicles or more than 16000 long haul fuel cell trucks," Mikhail Chudakov, IAEA Deputy DG and Head of the Department of Nuclear Energy, said in his opening remarks. "This is why nuclear hydrogen can be a game changer in the fight against climate change." "Decarbonizing heavy industry, energy storage and even

synthetic fuel production are some of the many roles it can assist us with in the clean energy transition."

Hydrogen is the most abundant element in the universe but producing it in pure form for industrial processes – ranging from producing synthetic fuels and petrochemicals to manufacturing semiconductors and powering fuel cell electric vehicles – is energy intensive and currently with a significant carbon footprint. To reduce the environmental impact of the world's annual

production of over 70 million tonnes of hydrogen, several countries are looking to nuclear power....

Nikolay Kodochigov, Advisor to the Director General of JSC Afrikantov OKBM, a nuclear engineering company located in Nizhny Novgorod in Russia, provided details on his country's development of nuclear hydrogen production. This includes a project at the Kola Nuclear Power Plant in north-western Russia, which involves construction of a pilot plant for testing electrolysers and gaining experience in hydrogen storage, transportation and application. David Campbell, Director of Bruce Power Centre for Next Generation Nuclear at the Nuclear Innovation Institute in Canada, described an ongoing project that is

looking into producing nuclear hydrogen to capitalise on Ontario's existing clean power grid and its baseload surplus.... Kees Jan Steenbock, Director of Government Affairs at UK nuclear fuel company URENCO, presented the preliminary conclusions of a study commissioned by URENCO that examined the potential role of nuclear-produced hydrogen in helping to decarbonize the UK economy by 2050....

Source: <https://www.iaea.org/newscenter/news/iaea-event-showcases-progress-innovations-in-nuclear-hydrogen-for-a-clean-energy-transition>, 21 September 2021.

RUSSIA

Trial of Advanced Fuel Begins at Rostov

Three fuel assemblies which each contain 12 experimental rods were loaded into unit 3 of the Rostov plant when it came back into operation from scheduled maintenance. Six rods have cladding made from chromium-nickel alloy, and the other six have a standard zirconium alloy cladding with chromium coating.

The use of these metals can "completely eliminate or significantly slow down" the zirconium-steam

reaction, which has produced hydrogen in historical nuclear accidents. It was this hydrogen that caused the extensive damage to the reactor buildings at Fukushima Daiichi and it also played a role in worsening the Chernobyl accident. Eliminating this possibility would mean a step-change in the safety of a majority of the world's operating nuclear reactors....

Since 2018, Rosatom has been testing advanced fuel for its VVER reactors. Its experimental designs completed two full irradiation cycles in the MIR research reactor and TVEL said they remained hermetically sealed, meaning they were not distorted "too much" by the intense heat, pressure and radiation of the reactor core. Four different

combinations of cladding and fuel matrix materials have been tested in MIR: in addition to uranium dioxide, uranium-molybdenum alloy with high thermal conductivity has been also used for fuel pellet fabrication. However, TVEL made the "conservative" choice of using uranium dioxide in the Rostov trial, saying there was international consensus that new fuel matrices should be introduced gradually.

Source: <https://www.world-nuclear-news.org/Articles/Trial-of-advanced-fuel-begins-at-Rostov>, 21 September 2021.

NUCLEAR ENERGY

BELARUS

Second Belarusian Reactor Nears Operation

Karankevich said that Ostrovets 2 is "almost 90%" ready for power generation and he expects fuel to be loaded before the end of this year and for it to start up in 2022. A five-year framework for cooperation between Belarus and the IAEA between 2022 and 2027 was discussed in a meeting between Karankevich and IAEA DG Grossi. Before the end of this year, two more missions by IAEA expert teams will visit Ostrovets.

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The Belarusian Ministry of Energy said: "Belarus has conducted all IAEA missions recommended for countries building their first nuclear power plant. The received recommendations and proposals were put into national action plans, which are an important guideline in the implementation of the national nuclear power programme." The Ostrovets plant has also been visited and accepted technical recommendations from the European Nuclear Safety Regulators Group and the World Association of Nuclear Operators. Karankevich invited Grossi to attend a commissioning ceremony for the Ostrovets power plant when it reaches full operation with the start of unit 2 next year.

Source: <https://www.world-nuclear-news.org/Articles/Second-Belarusian-reactor-nears-operation>, 21 September 2021.

CHINA

China's HTR-PM Reactor Achieves First Criticality

The first of the two high-temperature gas-cooled reactors of the demonstration HTR-PM plant at Shidaowan, in China's Shandong province, attained a sustained chain reaction for the first time on December 12. The reactor is scheduled to be connected to the electricity grid before the end of 2021. The No.1 reactor achieved first criticality at 9.35am on 12 September, China Huaneng announced. It noted this milestone was reached 23 days after the start of fuel loading....

Construction of the demonstration HTR-PM plant - which features two small reactors that will drive a single 210 MWe turbine - began in December 2012. China Huaneng is the lead organisation in the consortium to build the demonstration units

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(with a 47.5% stake), together with China National Nuclear Corporation subsidiary China Nuclear Engineering Corporation (CNEC) (32.5%) and Tsinghua University's Institute of Nuclear and New Energy Technology (20%), which is the research and development leader. Chinergy, a joint venture of Tsinghua and CNEC, is the main contractor for the nuclear island.

China Huaneng noted the localisation rate of HTR-PM equipment reached a level of 93.4%. It noted that as the world's first pebble-bed modular high-temperature gas-cooled reactor, the demonstration project used more than 2000 sets of equipment for the first time, and more than 600 sets of innovative equipment, including the world's first high-temperature gas-cooled reactor spiral coil once-through steam generator. It also features the first high-power, high-temperature thermal electromagnetic bearing structure for the main helium fan, as well as the world's largest and heaviest reactor pressure vessel.

Cold functional tests - which aim to verify the reactor's primary loop system and equipment as well as the strength and tightness of its auxiliary pipelines under pressure higher than the design pressure - were completed at the HTR-PM's two reactors on 19 October and 3 November 2020, respectively. Hot functional tests, which simulate the temperatures and pressures which the reactor systems will be subjected to during normal operation, started in January...

The HTR-PM has the advantages of inherent safety, a high equipment localisation rate, modular design and adaptation to small and medium-sized power grids. It also has broad range of potential commercial applications, including power generation, cogeneration of heat and power, and high-

temperature process heat applications....

Source: <https://world-nuclear-news.org/Articles/Chinas-HTR-PM-reactor-achieves-first-criticality>, 13 September 2021.

GENERAL

IAEA Increases Projections for Nuclear Power Use in 2050

For the first time since the Fukushima Daiichi accident a decade ago, the IAEA has revised up its projections of the potential growth of nuclear power capacity for electricity generation during the coming decades. The change in the IAEA's annual outlook for this low-carbon energy source does not yet mark a new trend, but it comes as the world aims to move away from fossil fuels to fight climate change. Many countries are considering the introduction of nuclear power to boost reliable and clean energy production.

In the high case scenario of its new outlook, the IAEA now expects world nuclear generating capacity to double to 792 gigawatts (net electrical) by 2050 from 393 GW(e) last year. Compared with the previous year's high case projection of 715 GW(e) by 2050, the estimate has been revised up by just over 10%. However, the realization of the IAEA's high case scenario would require significant actions, including an accelerated implementation of innovative nuclear technologies....

"The new IAEA projections show that nuclear power will continue to play an indispensable role in low carbon energy production," IAEA DG Grossi said. "The report's findings represent an encouraging sign of increasing awareness that nuclear power, which emits no carbon dioxide during operation, is absolutely vital in our efforts

to achieve net zero emissions." According to the report, the 2021 projections reflect growing recognition of climate change issues and the importance of nuclear power in reducing emissions from electricity generation. Commitments under the 2015 Paris Agreement could support nuclear power development if the necessary energy policies and market designs facilitate investments in

dispatchable, low-carbon technologies. The IAEA's high case projections of a doubling of nuclear capacity by 2050 are close to the International Energy Agency's projections in the publication "Net Zero by 2050 – A Roadmap for the Global Energy Sector" from May this year....

According to the IAEA's high case projection, nuclear energy could contribute about 12% of global electricity by 2050, up from 11% in last year's 2050 high case projections. Nuclear power generated around 10% of the world's electricity in 2020. The low case scenario was unchanged with a projected share of 6% for nuclear in the total electricity generation. Coal remains the dominant energy source for electricity production at about 37% for 2020, changing little since 1980.

New low-carbon technologies such as nuclear hydrogen production or small and advanced reactors will be crucial to achieving net zero. Nuclear power could provide solutions for electricity consumption growth, air quality concerns, and the security of energy supply. Many innovations for the expanded use of nuclear techniques in related areas such as heat or hydrogen production are underway.... Since it was first published 40 years ago, the IAEA's projections

The HTR-PM has the advantages of inherent safety, a high equipment localisation rate, modular design and adaptation to small and medium-sized power grids. It also has broad range of potential commercial applications, including power generation, cogeneration of heat and power, and high-temperature process heat applications...

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have been continually refined to reflect an evolving global energy context. Over the past decade, nuclear power development has remained within the range of projections described in prior editions.

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-increases-projections-for-nuclear-power-use-in-2050>, 16 September 2021.

.RUSSIA

Kursk II-1 Reactor Vessel Delivered

The heavy component, described by Rosatom as the “heart” of the power plant, was made at Atomash’s factory in Volgodonsk region, requiring a journey of 1500 kilometres by river and 300 kilometres by road. The VVER-TOI reactor vessel weighs 340 tons and is 12 metres long. Kursk II is a new power plant under construction, intended to replace the four older units of Kursk, which will retire from service from 2022 to 2031. The new units are the VVER-TOI design by Hidropress, which are optimised with a focus on digital manufacturing and operation.

Rosatom said the component is made of nickel-free steel, the performance of which is not affected by radiation or at high temperatures. It has only four welded joints, compared to six on the VVER-1200 model, which further reduces its susceptibility to ageing through intense radiation exposure. “This will allow, after 60 years of operation, to extend the service life of the hull by another 40 years,” said Andrei Osharin, first deputy director for construction of new units at Kursk nuclear power plant.

Source: <https://www.world-nuclear-news.org/Articles/Kursk-II-2-reactor-vessel-delivered>, 20

September 2021.

Russia Advances on Plans for New Floating Nuclear Plant

A Russian plan to build more floating nuclear power plants advanced this month after two subsidiaries of Rosatom, Russia’s state nuclear corporation, signed a cooperation agreement to power a remote mining facility on Siberia’s northeastern tip. The new waterborne facilities will come on the coattails of the Akademik Lomonosov, the audacious experiment on floating nuclear power that Rosatom connected to a remote port in Chukotka in 2019 after spending more than a decade constructing it, amid objections from environmentalists.

New low-carbon technologies such as nuclear hydrogen production or small and advanced reactors will be crucial to achieving net zero. Nuclear power could provide solutions for electricity consumption growth, air quality concerns, and the security of energy supply.

The new agreement unites Atomflot, Rosatom’s nuclear icebreaker wing, and Atomenergomash, its engineering division, in an effort to build what officials have called “streamlined” floating nuclear plants, each based on a pair of 55 megawatt RITM-200 reactors — the type featured in Russia’s new generation nuclear icebreakers.

The deal also falls in line with Rosatom’s burgeoning interest in building nuclear plants based on small modular reactors, or SMRs – a technology the company sees as solution for energy deficits in remote regions. Since January, the corporation has been developing a plant based

on such reactors in the Siberian region of Yakutia, promising it will come on line by 2028. The new agreement unites Atomflot, Rosatom’s nuclear icebreaker wing, and Atomenergomash, its engineering division, in an effort to build what officials have called “streamlined” floating nuclear plants, each based on a pair of 55 megawatt RITM-200 reactors — the type featured in Russia’s new generation nuclear icebreakers....

Under the new agreement, four floating plants will deploy to the nascent Baimsky copper and gold mining project in Chukotka – located nearer Alaska than Moscow – by the end of 2026.... Nuclear power already plays a role in Baimskaya’s development as early facilities there are powered

by the Akademik Lomonosov. KAZ Minerals said the plant will supply up to 20 MWe of nuclear power to the mine during its construction phase. According to earlier reports in Russian media, Rosatom will construct three new floating plants at St Petersburg's Baltic Shipyard – the shipyard where nearly all of Russia's nuclear icebreakers, as well as the Akademik Lomonosov, were built. A fourth identical plant, also to be built at the shipyard, would be kept in reserve, and rotate in when any of the original three require refueling or maintenance...

The first two the four new floating nuclear plants are due at their working location on Chaunskaya Bay in the East Siberian Sea by 2026. Once there, they will be connected to powerlines spanning 400 kilometers to the Baimskaya mine. The third unit is due to be connected at the end of 2027, increasing the total power supply to about 330 megawatts.

The new deals reached this month confirm Russian media reports from May in which numerous government officials hinted that President Putin had given his nod to powering the Baimskaya fields with floating nuclear plants. It also conforms to the wider ambitions of Rosatom, which have long circled around the notion of building a smaller, more streamlined version of the hulking Akademik Lomonosov, both for remote mining and hydrocarbon ventures, and to market to foreign customers.

In December, the official Tass newswire quoted Russian politicians as saying numerous foreign countries are interested in acquiring what they call "optimized" floating nuclear plants. While it remains unclear precisely which countries those are, Rosatom has long claimed that unspecified governments in North Africa, the Middle East and Southeast Asia are interested in acquiring floating nuclear plants. Tass also reported that Rosatom was in talks with Cuba about both land-based and floating reactors. The company also discussed the possibility of building a floating plant for Sudan in 2018.

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Source: <https://bellona.org/news/nuclear-issues/2021-09-russia-advances-on-plans-for-new-floating-nuclear-plants>, 17 September 2021.

SOUTH AFRICA

South Africa Plans Next Phase of New 2,500 MW Nuclear Plant

South Africa is forging ahead with plans for a new 2,500-megawatt nuclear power plant in a bid to boost energy security and wants to end the procurement process by 2024. "We plan to issue the Request for Proposal (RFP) for 2,500MW nuclear programme at end of March 2022 and complete the procurement in 2024 to support the economic reconstruction and recovery plan and ensure security of energy supply" Nobhule Pamela said in an address to the IAEA.... Last month, South Africa's energy regulator backed a long-term government plan to build new nuclear power units, a move that could help to shift the country away from coal and into less carbon-intensive means of generating electricity.

We plan to issue the Request for Proposal (RFP) for 2,500MW nuclear programme at end of March 2022 and complete the procurement in 2024 to support the economic reconstruction and recovery plan and ensure security of energy supply.

Africa's most industrialised economy has the continent's only operating nuclear plant, a 1,900- MW facility outside Cape Town that was built under

apartheid. However, much of its electricity supply comes from a fleet of coal-fired power plants that spew harmful emissions into the air and many of which are set for closure within a decade as South Africa cuts down emissions.

South Africa, which experiences regular blackouts due to erratic power supplies, has said it said it will look to expand its nuclear capacity at a pace

and time it could afford, after abandoning in 2018 a massive nuclear expansion plan championed by former president, Jacob Zuma. Analysts had expressed serious concern about Zuma's project for an array of nuclear plants totalling 9,600 MW because it would have put massive extra strain on South Africa's public finances as it faced a raft of credit rating downgrades.

Source: <https://www.reuters.com/world/africa/safrica-plans-next-phase-new-2500-mw-nuclear-plant-2021-09-21/>, 21 September 2021.

UAE

Second Barakah Unit Connected to the Grid

Unit 2 at the Barakah nuclear power plant in the UAE has on September 14 begun supplying electricity to the country's power grid, the Emirates Nuclear Energy Corporation (ENEC) announced. The milestone was reached five months after unit 1 of the plant, in the Al Dhafra region of Abu Dhabi, entered commercial operation.

ENEC said its operations and maintenance subsidiary, Nawah Energy Company, had safely and successfully connected the unit to the UAE grid, delivering the first megawatts of carbon-free electricity from the second of four units at the Barakah plant. It said during the grid connection process, the unit 2 generator was integrated and synchronised with the requirements of the UAE's national electricity transmission grid.

The UAE's Federal Authority for Nuclear Regulation (FANR) issued an operating licence for Barakah 2 to Nawah in March, with fuel loading beginning soon after. The unit achieved first criticality - an initial sustained chain reaction - on 27 August 2021.... Nuclear operators will now begin the

process of gradually raising the power levels of Barakah 2's reactor, known as power ascension testing. ENEC said that throughout this process, the unit 2 systems follow international best practice to safely progress and test the unit as it proceeds towards full electricity production. This testing will be conducted under the continued oversight of FANR.

Under a USD20 billion deal announced in December 2009, four Korean-designed APR1400 reactors are being built at Barakah by a consortium led by the Korea Electric Power Corporation. First concrete for Barakah 1 was poured in July 2012, while that for units 2-4 was poured in April 2013, September 2014 and July 2015, respectively....

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Clean Energy Ambitions:

ENEC said the grid connection of unit 2 brings it "another step closer to the half-way mark of its goal to supply up to a quarter of the country's electricity needs 24/7, while driving reductions in carbon emissions - the leading cause of climate change." UAE Minister of Energy and Infrastructure Al Mazrouei welcomed the start of electricity supply by Barakah 2, saying it contributes to achieving the goals of the

UAE's Energy Strategy 2050, which aims to increase the share of clean energy in the total energy mix to 50%.

"We are proud of this new milestone accomplished within the UAE Peaceful Nuclear Energy Programme," Al Mazrouei said. "The Barakah nuclear energy plant plays a

pivotal role in achieving the UAE's goals of diversifying energy sources, increasing the share of clean energy resources and supporting economic and social development, as well as meeting the UAE's objectives and international commitments to address the challenges of

The Barakah plant contributes to consolidating the UAE's leading role in the regional and global energy sectors, as the plant is now the largest single generator of electricity in the Arab world. It is also the largest contributor to reducing carbon emissions in the region; positioning the UAE as the first Arab country to have a multi-unit nuclear energy plant in operation.

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Source: <https://www.world-nuclear-news.org/Articles/Second-Barakah-unit-connected-to-the-grid>, 14 September 2021.

NUCLEAR COOPERATION

AUSTRALIA-UK-USA

Australia, UK and US to 'Engage' with IAEA Over Nuclear Submarines

Australia, Britain and the US have informed the UN atomic watchdog of their new security partnership that will help Australia acquire nuclear submarines, and both sides plan to "engage" over the coming months.... The IAEA is tasked with keeping track of all nuclear material in countries that, like Australia, have ratified the nuclear NPT so as to make sure none of it is being siphoned off for use in a nuclear bomb - an area of IAEA work known as safeguards.

So far, only the five nuclear weapons states recognised by the NPT - the US, Russia, China, France and Britain - plus India, which has not signed the NPT, have deployed nuclear-powered submarines. For a party to the NPT other than the so-called P5 to have nuclear submarines poses a challenge because they are military vessels that are designed to be undetectable and would often be beyond the reach of IAEA inspectors. It is, however, possible in principle to temporarily exclude submarine reactor fuel from IAEA

The IAEA said in a statement the trio had informed it "that a critical objective of this cooperation will be to maintain 'the strength of both the nuclear non-proliferation regime and Australia's exemplary non-proliferation credentials' and that they will be 'engaging with the IAEA throughout the coming months.

safeguards if a prior agreement is reached with the body.

The IAEA said in a statement the trio had informed it "that a critical objective of this cooperation will be to maintain 'the strength of both the nuclear non-proliferation regime and Australia's exemplary non-proliferation credentials' and that they will be 'engaging with the IAEA

throughout the coming months'." "The three countries have informed the IAEA at an early stage on this development. The IAEA will engage with them on this matter in line with its statutory mandate, and in accordance with their respective safeguards agreements with the Agency," it added.

Source: <https://www.reuters.com/world/china/australia-uk-us-plan-engage-with-iaea-over-nuclear-submarines-2021-09-16/>, 16 September 2021.

CHINA-PAKISTAN

China-Pakistan New Nuclear Deal May Push World towards Renewed Arms Race, Conflict

All-weather allies Pakistan and China signed a new nuclear agreement that will push the world towards a renewed nuclear race and conflict.... The Framework Agreement on Deepening Nuclear Energy Cooperation was signed by Pakistan Atomic Energy Commission (PAEC) and China Zhongyuan

Engineering Cooperation on September 8, 2021. The agreement, finalised at a high-level meeting on August 20, 2021, was signed through virtual mode and would remain valid for ten years.... The agreement envisages the transfer of nuclear technology, uranium mining and processing, nuclear fuel supply and setting up research reactors, which will help Pakistan increase its

The agreement envisages the transfer of nuclear technology, uranium mining and processing, nuclear fuel supply and setting up research reactors, which will help Pakistan increase its nuclear weapons stockpile. For China, an enhanced Pak nuclear arsenal adds teeth to its grand strategy of countering India's military strength.

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Although the 2021 agreement envisages cooperation in construction, maintenance and waste management of nuclear power reactors, the likelihood of diversion of technology and material for reprocessing facilities meant for producing nuclear warhead material remains dangerously high, if past experience of Pakistan's illegal nuclear trade and diversion is to be taken into account.... These suspicions are strengthened by the agreement's sweeping scope and content. The main thrust of the agreement is comprehensive cooperation on the construction and maintenance of all future nuclear power projects in Pakistan. Four new plants are on the anvil-two to be located at Karachi (K-4/K-5) and two at Muzaffargarh (M-1/M-2). These plants will be constructed under the Engineering Procurement and Construction Mode by adopting Chinese Hualong One Pressurize Water Reaction (HPR)-100 technology.... As per the agreement, besides the construction of these four plants, China will strengthen its involvement in operating and maintaining all nuclear power plants in Pakistan, including refuelling outages, technical up-gradation and spare parts. Supplementary agreements to augment the main agreement are to be signed in the near future.

Five significant components of the agreement which offers Pakistan unprecedented access to China's nuclear capability in terms of technology, material and training are - a) Exploration and mining of uranium and training of personnel; b) Lifetime nuclear fuel supply and supply of initial refuelling fuel assemblies and associated core components; c) setting up of miniature neutron source reactor; d) Radioactive management

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The SCEP is part of the U.S.-India Climate and Clean Energy Agenda 2030 Partnership, a collaborative effort launched in April by President Biden and India's prime minister, Narendra Modi, at the Leaders Summit on Climate.

resources and assistance, including decommissioning of nuclear facilities, radioactive waste transport and disposal and radiation protection measures and; e) Nuclear technology application, including nuclear medicine, irradiation processing, radiopharmaceuticals, radioactive sources supply and manpower training....

The China-Pakistan nuclear cooperation dates back to 1986. China over the years has utilised official agreements to supply Pakistan with technology and material for nuclear warheads. The September 2021 agreement substantially expands this cooperation with China helping strengthen Pakistan's nuclear industry chain by setting up additional plants, aiding uranium exploration, supply of nuclear fuel, nuclear waste management and nuclear technology applications....

Source: <https://www.aninews.in/news/world/asia/china-pakistan-new-nuclear-deal-may-push-world-towards-renewed-arms-race-conflict20210918062533/>, 18 September 2021.

USA-INDIA

Revamped US-India Strategic Clean Energy Partnership Launched

U.S. energy secretary Jennifer Granholm and India's minister of petroleum and natural gas, Hardeep Singh Puri, on 9 September 2021 presided over the virtual launch of what the Department of Energy termed the "newly revitalized" U.S.-India Strategic Clean Energy Partnership (SCEP). The SCEP is part of the U.S.-India Climate and Clean Energy Agenda 2030 Partnership, a collaborative effort launched in April by President Biden and India's prime minister, Narendra Modi, at the Leaders Summit on Climate. According to a September 9 DOE press release, the revamped

SCEP “places greater emphasis on electrification and decarbonization of processes and end uses, scaling up and accelerating deployment of emerging clean energy technologies, and finding solutions for hard-to-decarbonize sectors.”

Among other commitments, the US and India have agreed under the SCEP to continue cutting-edge research and development through the U.S.-India Partnership to Advance Clean Energy–Research, prioritizing research on emerging clean energy technologies; continue to advance innovation in civil nuclear power as a net-zero solution through different collaborative programs, including the long-standing Civil Nuclear Energy Working Group; and engage the private sector and other stakeholders to help deploy clean technologies to accelerate a clean energy transition....

Source: <https://www.ans.org/news/article-3251/revamped-usindia-strategic-clean-energy-partnership-launched/>, 15 September 2021.

NUCLEAR PROLIFERATION

AUSTRALIA

Australian Nuclear Submarine Plan ‘Wrong Direction at the Wrong Time’, Nobel Prize-Winning Group Says

Australia’s decision to build nuclear submarines will isolate Australia from its regional neighbours who have, for decades, pursued a nuclear-free Pacific, the ICAN has said. While the Australian government and defence force have insisted the submarines will be nuclear-powered, and never nuclear-armed, ICAN, the winner of the 2017 Nobel Peace Prize, argues that a military nuclear reactor built in Adelaide was a “foot in the door” towards weapons development.

“As the world is moving towards making these weapons illegal, this is the wrong direction at the wrong time,” Gem Romuld, Australia Director of

ICAN, told Guardian Australia. Pacific anti-nuclear campaigners have reacted with disapproval, while the New Zealand government says Australia’s nuclear submarines will be banned from its nation’s

waters.... “Important questions remain over construction of the submarines and the potential imposition of military nuclear reactors on Adelaide or other cities, making construction sites and host ports certain nuclear targets. “Military nuclear reactors in Australia would present a clear nuclear weapons proliferation risk and become potential

sites for nuclear accidents and radiological contamination long into the future.”

The Guardian understands Australia does not plan to build the submarines’ nuclear reactors domestically. Instead, the reactor modules would be delivered, sealed, to

Australia from either the US or the UK, where they would be installed into the vessels. But Romuld said the nuclear submarine decision was “alarming” because it represented an escalating nuclearisation of Australia’s military capabilities; increasing military ties with nuclear weapons powers the UK and US; and a “shift towards nuclear interoperability at a time when the world has moved towards making these weapons illegal”.

In January this year, a global treaty on the prohibition of nuclear weapons (TPNW), came into force, outlawing parties to the treaty from developing, testing, producing, possessing, or stockpiling nuclear weapons. It is not supported by any of the world’s nine nuclear-armed states. Australia, also, does not support the treaty, relying on the deterrent effect of the US “nuclear

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umbrella". Australia, however, is a party to the Treaty of Rarotonga, which establishes a nuclear weapons free zone in the South Pacific.

PM Morrison said the AUKUS security alliance, and the adoption of nuclear submarines, was not a step towards nuclear weapons development. "Let me be clear, Australia is not seeking to acquire nuclear weapons or establish a civil nuclear capability. "And we will continue to meet all our nuclear non-proliferation obligations." ... The chief of the Australian defence force, General Campbell, said Australia's "commitment to our obligations under the non-proliferation treaty are absolute"

New Zealand has already said Australia's nuclear-powered submarines will be banned from its waters. Wellington has maintained a ban on nuclear-powered vessels since 1985, a response to French nuclear testing in the Pacific... Across the Pacific, where thousands live daily with the legacy of nuclear testing and disposal of nuclear waste, there was disappointment....

Source: <https://www.theguardian.com/australia-news/2021/sep/16/australian-nuclear-submarine-plan-wrong-direction-at-the-wrong-time-nobel-prize-winning-group-says>, 16 September 2021.

NORTH KOREA

Satellite Photos Indicate North Korea Expanding Uranium Enrichment

Satellite photos revealed that North Korea is expanding its uranium enrichment plant, a move that experts say indicates that the country aims to increase the production of bomb materials... Jeffrey Lewis and two other experts at Middlebury Institute of International Studies at Monterey said in a report that the expansion of the uranium enrichment plant could mean a significant increase in uranium production. "The expansion of the enrichment plant probably indicates that North Korea plans to increase its production of weapons-grade uranium at the Yongbyon site by as much as 25%" the experts said.

The report added that satellite photos taken at the beginning of the month by imagery company Maxar showed forest clearing to prepare the ground for construction. An image taken on Sept. 14 showed that a wall had been erected to enclose the area. Overall, the area measures about 10,760 square feet with enough space to store nearly 1,000 centrifuges. The images also showed work being done to remove panels from one side of the enrichment plant to allow access into the new enclosed area.

The expansion of North Korea's plant, which is located at its Yongbyon nuclear complex, follows the country's move to execute missile tests for the first time in six months. The tests and the materials expansion come as disarmament negotiations between the northern Asian country and the US remained suspended....

Satellite photos taken in August reportedly showed that North Korea resumed the operation of facilities that produce plutonium. In 2019, Kim Jong Un proposed dismantling the Yongbyon complex, which has been called "the heart" of North Korea's nuclear program, but former President Trump shot down the offer at the time, viewing it as a limited denuclearization step.

Source: <https://thehill.com/policy/international/asia-pacific/572854-satellite-photos-indicate-north-korea-expanding-uranium>, 18 September 2021.

NUCLEAR NON-PROLIFERATION

IRAN

UN Monitoring Cameras Damaged in Terrorist Attacks: Iranian Official

Some of the monitoring cameras installed by UN nuclear inspectors at Iranian nuclear sites under the 2015 nuclear agreement "were damaged in recent terrorist attacks" and were not replaced due to other deal parties not fulfilling their commitments... Talking on the sidelines of a meeting with the Iranian Parliament's National Security and Foreign Policy Commission, Eslami

noted the cameras required under the NPT's safeguards agreement with the IAEA are working, but those related to the 2015 agreement "were no longer necessary, given the counterparts' non-compliance". Eslami told reporters on September 15 that a meeting was held with Grossi, DG of the IAEA, in order to clear up any "ambiguity" and "clarify" matters, and Iran is now confident that "no ambiguities currently exist at the IAEA concerning Iran's nuclear program"....

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The two issued a statement reaffirming a spirit of cooperation and mutual trust. According to the statement, Grossi and Eslami will meet at the IAEA General Conference scheduled from September 20 to 24, and Grossi will visit Tehran in the near future to hold high level consultations with the Iranian authorities....

More precise understanding of the accident, improvements related to the regulation systems, enhancement of scientific knowledge, development of safe decommissioning and reasonable waste management are among the key areas where progress has been made during the last decade.

Source: <https://www.socialnews.xyz/2021/09/16/un-monitoring-cameras-damaged-in-terrorist-attacks-iranian-official/>, 16 September 2021.

NUCLEAR SAFETY

GENERAL

A Decade of Progress in Safety Since the Fukushima Daiichi Accident Highlighted at the Annual Forum of the International Nuclear Safety Group

Progress in decommissioning of the Fukushima Daiichi Nuclear Power Plant, improved assessment of external hazards such as earthquakes, regulatory and safety upgrades implemented at nuclear power plants globally as well as the safety of advanced and innovative reactors were among topics discussed at the annual International Nuclear Safety Group (INSAG), held on 20 September 2021 on the sidelines of the 65th IAEA General Conference....

Participants, high-level experts who provide authoritative advice and guidance on safety issues

to the global safety community, also discussed global efforts since the 2011 Fukushima accident to strengthen regulatory oversight, put in place effective accident management as well as improvements in human and organisational factors, public communication and post-accident recovery measures....

Panellists agreed that more precise understanding of the accident, improvements related to the regulation systems, enhancement of scientific knowledge, development of safe decommissioning and reasonable waste management are among the key areas where progress has been made during the last decade. The International Conference on a Decade of Progress after Fukushima-

Daiichi: Building on the Lessons Learned to Further Strengthen Nuclear Safety, to take place 8-12 November 2021, in Vienna, will be a platform to discuss these topics further.

Other panellists shared the implementation of best practices in their national regulatory systems as a result of lessons learned from the accident. Basma A. Shalaby highlighted Canada's holistic review and assessment to regulation, adopted by the industry, at all levels of the defence in-depth approach, which assures prevention and mitigation of accidents at several engineering and procedural levels. The INSAG meeting also covered progress over the last decade in advanced and innovative reactors such as SMRs....

In concluding the event, panellists highlighted the importance of the forthcoming Conference and their readiness to continue discussions on the impact of climate change, the role of nuclear energy, the value of new digitalized reactors, the lessons learnt from the accident in radiation protection, the prospects to improve communication based on knowledge and more.

The Role of INSAG: INSAG is a group of experts with a high level of professional competence in the field of nuclear and radiological safety. Group members work in regulatory organizations, technical support organisations, research and academic institutions and the nuclear industry. INSAG is convened under the auspices of the IAEA with the objective to provide authoritative advice and guidance on nuclear safety approaches, policies and principles. In particular, INSAG provides recommendations and opinions on current and emerging nuclear safety issues to the IAEA, the nuclear community and the public in INSAG Series Reports and annual letters of assessment to the IAEA DG. The group was created in 1985.

Source: <https://www.iaea.org/newscenter/news/a-decade-of-progress-in-safety-since-the-fukushima-daiichi-accident-highlighted-at-the-annual-forum-of-the-international-nuclear-safety-group>, 20 September 2021.

Safety of SMRs Highlighted at General Conference

There is an increased interest among countries in the development and deployment of innovative nuclear technologies to meet future energy demand. How the IAEA can help national authorities adapt and develop standards for these emerging technologies was among the key topics discussed at the side event, Licensing Novel Advanced Reactors: Addressing the Challenges, held on the sidelines of the 65th IAEA General Conference on 21 September 2021.

Advanced reactors have been in development for several years, and several SMRs are under licensing review by national authorities, while many other designs, including for high

temperature gas cooled reactors, lead fast reactors, sodium fast reactors, molten salt reactors and micro reactors, are at the design safety review stage. SMRs produce electricity of up to 300 MW(e) per module and can be pre-fabricated in a factory and assembled on site, significantly decreasing the time it takes to deploy a reactor. They can easily complement renewable energy sources and can be deployed in areas outside the reach of national grids.

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During the event, participants discussed their experience in evaluating SMR designs and provided insights on lessons learned through their experience with evaluating SMR safety.... As the concepts and designs of innovative technologies,

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including SMRs, are technologically diverse, the IAEA is working on the establishment of a technology-neutral framework for safety to help harmonize international approaches on the basis of existing IAEA safety standards...

SMRs and innovative technologies can be very different from the current operating fleet. For example, innovative reactors can use different fuels and coolants.... The IAEA Working Group on SMR Safety has completed the review of over 60 safety standards to guide their application to a range of SMRs and innovative technologies lifecycle and will publish a safety report next year... Participants at the meeting discussed the issues faced in the application of IAEA safety standards given the differences in the design, siting, construction, commissioning, operation, decommissioning, radioactive waste management, safety assessment and regulation of innovative technologies compared to operating reactors.... IAEA representatives at the meeting presented a Programme of Work to develop further the necessary guidance and disseminate knowledge on the safety of these technologies

with support from the international community....

Source: <https://www.iaea.org/newscenter/news/safety-of-smrs-highlighted-at-general-conference>, 21 September 2021.

IAEA-EU

IAEA and European Union Extend Cooperation in Nuclear Safety

Over a hundred nuclear safety review missions, environmental remediation at former uranium sites in Central Asia and more effective radioactive waste management in Africa: these are just some of the major achievements of the cooperation between the IAEA and the EU, which was extended today.... Meeting on the margins of 65th IAEA General Conference, the two sides extended their 2013 cooperation agreement on the safe management of radioactive waste, regulatory arrangements, safety reviews and assessments, emergency preparedness and response, environmental remediation and the development and application of IAEA Safety Standards....

One of the IAEA's flagship services is its array of peer reviews to assess nuclear safety and security practices in countries. The EU has supported the development of peer review services like the Integrated Regulatory Review Service (IRRS) and the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS). In turn, these reviews have enabled compliance of EU countries with their obligations under the EU Nuclear Safety and Waste Directives. Since 2013, 116 IRRS missions and 12 ARTEMIS missions have been carried out to assess regulatory practices and radioactive waste and spent fuel management.

Building Nuclear Safety Arrangements Globally: EU support has also helped the IAEA to deliver projects across the globe in all areas of nuclear safety. In Central Asia, the IAEA has provided expert advice in environmental remediation to

countries affected by the legacy of uranium mining. These legacy sites, operational until the 1990s, present a potential threat to the health of the local population and the environment. In Africa, the EU/IAEA cooperation enabled the implementation of projects to enhance the safety of research reactors and more effective radioactive waste management.

Countries in the Mediterranean that are not EU Member States received support to strengthen their coastal emergency preparedness and response arrangements in case of radiological emergencies as well as the full control of radioactive sources during and after their operations, under what is known as the "cradle to grave" approach....

Source: <https://www.iaea.org/newscenter/news/iaea-and-european-union-extend-cooperation-in-nuclear-safety>, 21 September 2021.

Source: <https://www.iaea.org/newscenter/news/iaea-and-european-union-extend-cooperation-in-nuclear-safety>, 21 September 2021.

INDONESIA-USA

Indonesia, US Extend Cooperation on Nuclear Safety

The Indonesian Nuclear Energy Regulatory Agency (Bapeten) and the US Nuclear Regulatory Commission (USNRC) have extended cooperation to exchange technical information on nuclear safety and radiation protection. "The cooperation is aimed at improving infrastructures, particularly to increase the capability of human resources to regulate the use of nuclear energy as well as to address the latest challenge facing Bapeten."

The areas of the cooperation cover exchange of technical information, joint research on nuclear safety and radiation protection, regulatory review and study, and capacity building. The existing cooperation between Bapeten and USNRC has benefited Bapeten to develop supervisory capacity through the exchange of information and experience.... The MoU was signed on the sidelines of the 65th General Assembly of the IAEA, held in Vienna, Austria, on September 23, 2021, and will be valid for five years, he informed.

Meeting on the margins of 65th IAEA General Conference, the two sides extended their 2013 cooperation agreement on the safe management of radioactive waste, regulatory arrangements, safety reviews and assessments, emergency preparedness and response, environmental remediation and the development and application of IAEA Safety Standards.

Source: <https://en.antaranews.com/news/190957/indonesia-us-extend-cooperation-on-nuclear-safety>, 25 September 2021.

ZIMBABWE

Zimbabwe Pledges Commitment to Nuclear Safety

The Republic of Zimbabwe pledged its commitment to nuclear safety and security by depositing legal instruments, thereby becoming a party to various international treaties under the auspices of the IAEA. Soda Zhemu, Minister of Energy and Power Development, handed over the instruments to IAEA DG Grossi at a short ceremony held as part of the annual Treaty Event alongside the 65th Regular Session of the General Conference....

Zimbabwe, which uses nuclear technologies in health, agriculture and research, joined the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the CPPNM, as well as the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The Head of the Zimbabwean Delegation will also sign the Additional Protocol to the country's Comprehensive Safeguards Agreement in the presence of IAEA's Director General....

Zimbabwe became the 129th party to the Convention on Early Notification of a Nuclear Accident, which was adopted in 1986 following the Chernobyl nuclear accident. State Parties to the Convention agree to provide relevant information to other States that could be possibly affected by a nuclear accident that could occur. The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, also

adopted in 1986, establishes an international cooperation framework between its parties, with the IAEA enabling prompt assistance, equipment and materials in case of an accident or emergency. With Zimbabwe joining this treaty, the Convention now has 123 parties.

Following Zimbabwe's accession to the Convention on the Physical Protection of Nuclear Material, the CPPNM now has 164 parties. The CPPNM focuses on the physical protection of nuclear material used for peaceful purposes during international transport. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, adopted in 1997, sets up the international legal framework to protect people and the environment from the harmful effects of ionising radiation. Zimbabwe is the 85th party to the Joint Convention....

Source: <https://www.esi-africa.com/industry-sectors/finance-and-policy/zimbabwe-pledges-commitment-to-nuclear-safety/>, 21 September 2021.

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NUCLEAR SECURITY

GENERAL

15 Years of the Integrated Nuclear Security Support Plan: IAEA Assists 112 Countries to Identify Security Needs

The IAEA today marked 15 years of the IAEA Integrated Nuclear Security Support Plan (INSSP), which lays the groundwork for nuclear security support by the organization. At a side event on the margins of the 65th IAEA General Conference, speakers highlighted the impact of INSSPs and how this support mechanism has evolved to better adapt to countries' needs.... The INSSP is a mechanism for States and the IAEA

to jointly review nuclear security regimes and to help States to identify areas that need to be strengthened. It also assists with coordinating the provision of nuclear security assistance from the IAEA and other assistance providers.

Since 2006, 112 countries have taken advantage of the INSSP mechanism. Upon request, the IAEA supports a State in the development of its country specific plan that outlines priorities and develops implementation strategies and a timeline to complete activities toward enhancing the country's nuclear security regime. The plan also identifies roles and responsibilities and helps to facilitate internal coordination among national authorities for different aspects of the nuclear security regime.

Based on guidance in the IAEA Nuclear Security Series, the INSSP is structured around six nuclear security areas: legislative and regulatory framework, threat and risk assessment, physical protection regime, detection of criminal and unauthorized acts involving material out of regulatory control, response to criminal and unauthorized acts including material out of regulatory control, and sustaining a State's nuclear security regime. In the past 15 years, 92 countries have endorsed their country specific plan, including Paraguay, which was the first country to approve an INSSP in 2006. The INSSPs of the other 20 countries are in various stages of progress....

As part of the INSSP mechanism, the IAEA and countries jointly conduct INSSP reviews approximately every three years to assess progress and reassess national priorities. About 105 INSSP Review Missions have been conducted, to date. "The INSSP is developed and reviewed taking inputs from all national stakeholders with nuclear security responsibilities, to ensure that

the Plan depicts an accurate picture of the situation in a concerned State and is being owned by the State," Evrard said. "Its benefits in connection to building and strengthening nuclear security coordination is well appreciated, and several States have established national nuclear security coordination mechanisms on the basis of their INSSP."

Providing Assistance, Adapting to Needs: Up to 80

per cent of requests for nuclear security assistance received by the IAEA are via the INSSP. From securing radioactive material in Colombia to the facilitation of a technical visit to strengthen nuclear security practices in Lebanon and Oman, the INSSP provides a customized framework to coordinate and implement nuclear security activities conducted by the individual country, the IAEA and potential donor countries. The IAEA's nuclear security programme, including assistance provided to countries upon request, is supported by voluntary contributions to the Nuclear Security Fund (NSF)....

Source: [https://](https://www.iaea.org/newscenter/news/15-years-of-the-integrated-nuclear-security-support-plan-iaea-assists-112-countries-to-identify-security-needs)

www.iaea.org/newscenter/news/15-years-of-the-integrated-nuclear-security-support-plan-iaea-assists-112-countries-to-identify-security-needs, 20 September 2021.

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NUCLEAR WASTE MANAGEMENT

CANADA-USA

Bipartisan House Group asks Biden to Stop Canada's Great Lakes Nuclear Storage Plans

Rep. Dan Kildee (D-Mich.) is calling on the Biden administration to stop the Canadian government from storing nuclear waste in the Great Lakes Basin. The Nuclear Waste Management Organization (NWMO), a non-profit established by the Canadian government, recently unveiled plans to construct a site that "would permanently store more than 50,000 tons of high-level nuclear waste" in the town of South Bruce, Ontario. "The

Great Lakes are central to our way of life, and permanently storing nuclear waste so close to our shared waterways puts our economies and millions of jobs at risk in the fishing, boating and tourism industries," Kildee said. "People in both the U.S. and Canada depend on the Great Lakes for drinking water, which could be contaminated if there ever was a nuclear waste incident." Kildee is offering a bipartisan resolution asking President Biden to work with the Canadian government to stop the plans for the storage. The resolution is co-sponsored by 11 Democrats and nine Republicans from states surrounding the Great Lakes....

In response to Kildee's announcement, a spokeswoman for Canada's NWMO told The Hill that the organization has reached out to the congressman directly, to offer him a briefing on the plans, expressing disappointment that he had not been in touch for more information. "The entire purpose of Canada's plan — the reason we are investing time, effort and money to implement it — is to protect people and the environment, including the Great Lakes,". "The used fuel will be moved from the surface, further from the lake than where it is now, and placed within a system of barriers to ensure passive safety for generations."

The NWMO, she explained, is considering two potential landlocked spaces for a deep geological repository — the southern one that Kildee specified and another in northern Ontario — and that plans would only go forward if they can be demonstrated as safe for humans and the environment and if they have the agreement of local host communities. Emphasizing that Canada's long-term storage plans are "consistent with best practice around the world," the spokeswoman noted that the interim storage methods used today "are not appropriate for the many thousands of

years" that nuclear waste remains hazardous, and that deep geological repositories are preferred by the scientific community.

"The U.S. has dozens of high-level nuclear waste storage sites along the Great Lakes and has had them for many years," the spokeswoman added.

"In Canada we are doing the responsible thing by implementing plans to place used nuclear fuel in a deep geological repository which, scientists from around the world agree, would permanently protect people and the environment including the lakes."

Source: <https://thehill.com/policy/equilibrium-sustainability/572764-bipartisan-house-group-asks-biden-to-stop-canadas-great>, 17 September 2021.

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JAPAN

Japan Eyes Disposal Abroad of Radioactive Plant Equipment

Japan plans to ease regulations to allow exports of large, disused equipment from nuclear power plants for overseas disposal as a way to reduce the mountains of radioactive waste accumulating at home. The setup would mark a major shift from the government's existing principle of disposing of all radioactive waste inside the country. The

industry ministry mentioned the revised disposal policy in the draft of the updated Basic Energy Plan, which awaits Cabinet approval in October at the earliest. Even if the plan is approved, it will likely take some time for the government and nuclear plant operators to clear a slew of hurdles, such as

estimating the costs of the project and ensuring the safety of shipments.

The Ministry of Economy, Trade and Industry, which oversees the nuclear industry, is considering outsourcing the disposal of three kinds of large low-level radioactive equipment overseas: steam

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generators, feed-water heaters and nuclear fuel storing and shipping casks. These components range in size from 5 to 20 meters and weigh 100 to 300 tons. Although they are not highly contaminated, compared with nuclear debris generated by spent fuel, they must be disposed of and managed properly, including being buried deep in the ground for years. The ministry is considering their export as an "exceptional measure" to deal with the grave issue of the radioactive waste accumulating at nuclear facilities across Japan....

The Ministry of Economy, Trade and Industry, which oversees the nuclear industry, is considering outsourcing the disposal of three kinds of large low-level radioactive equipment overseas: steam generators, feed-water heaters and nuclear fuel storing and shipping casks.

Nuclear plant operators have decided to decommission 24 reactors, including the six units at the crippled Fukushima No. 1 nuclear plant. Work to dismantle those reactors is expected to go into full gear starting in 2025. Excluding the reactors at the Fukushima plant, the decommissioned units will produce an estimated 165,000 tons of low-level radioactive waste.

Under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, signatory countries that produce radioactive waste are obliged, in principle, to dispose of it within their territories. But they can export the waste as exceptional cases if they obtain the consent of countries where business partners are based.

But more than 90 percent of that waste has nowhere to go for dismantling and disposal. Japan still lacks a dedicated disposal site for equipment used at nuclear plants, forcing plant operators to store the waste at their facilities....

Under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, signatory countries that produce radioactive waste are obliged, in principle, to dispose of it within their territories. But they can export the waste as exceptional cases if they obtain the consent of countries where business partners are based. However, Japan's Foreign Exchange and Foreign Trade Control Law bans such exports. Utilities have pressed the government for a change in the disposal policy, and the industry ministry has been reviewing the existing setup alongside experts on nuclear technology. Although the ministry intends to follow the principle of doing away with the

waste within Japan, it plans to approve exports of the three types of nuclear plant equipment on condition that they will be recycled....

Nuclear plant operators have the primary responsibility for disposing of low-level radioactive waste. And the actual costs these Japanese companies would have to pay to recyclers overseas is still unknown. The bill could be far more

expensive than initially estimated. How to safely ship the radiation-contaminated equipment abroad is another unresolved issue. The amount of nuclear waste in Japan has been growing since the 2011 Fukushima nuclear disaster. Utilities have

gradually resumed operations at nuclear plants, but some have decided to decommission reactors, particularly aging ones, largely because of the costs needed to upgrade them under new safety standards. For decades, Japan has been unable to secure a final disposal site for such waste inside the country, mainly because of

opposition from residents of candidate sites.

Source: <https://www.asahi.com/ajw/articles/14444199>, 20 September 2021.

USA

US Regulator Issues Licence for Interim Storage Facility

The US NRC has issued a licence to Interim Storage Partners LLC to construct and operate a consolidated interim storage facility for used nuclear fuel in Andrews, Texas. Interim Storage Partners is a joint venture of Waste Control Specialists LLC (WCS) and Orano USA. The licence authorises the company to receive, possess, transfer and store up to 5000 tonnes of used fuel and 231.3 tonnes of Greater-Than-Class C (GTCC) low-level radioactive waste for 40 years. GTCC is defined by the NRC as low-level radioactive waste with concentrations of radionuclides that exceed certain limits.

Interim Storage Partners intends to construct the storage facility on property adjacent to WCS's existing low-level radioactive waste disposal site, which is already operating under a Texas licence. The company has said it plans to expand the new facility in seven additional phases, up to a total capacity of 40,000 tonnes of fuel. Each expansion would require a licence amendment with additional NRC safety and environmental reviews. The used fuel and waste must be stored in canisters and cask systems, and these must meet NRC standards for protection against leakage, radiation dose rates, and criticality, under normal and accident conditions, the regulator said. The canisters are required to be sealed when they arrive at the facility, and remain sealed during

onsite handling and storage activities.

This is the second licence issued by the NRC for a consolidated storage facility for used fuel, the regulator said. It issued a licence in 2006 to Private Fuel Storage for a proposed facility in Utah, but that facility was never constructed. The agency is currently reviewing an application from Holtec International for a similar facility proposed for Lea County, New Mexico, on which it currently anticipates reaching a decision in January 2022.

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Source: <https://www.world-nuclear-news.org/Articles/US-regulator-issues-licence-for-interim-storage-fa>, 14 September 2021.



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