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**OPINION – Manpreet Sethi**

**What Does the Death of the Intermediate Nuclear Forces Treaty Mean?**

Amid a series of allegations and counter-allegations of violations by the two members of the INF treaty since 2014, the bilateral instrument was finally declared dead on August 2, 2019. Concluded in 1988 and in force since 1991, the treaty had served the purpose of fostering strategic stability well by outlawing an entire class of missile systems. Missiles in the intermediate range of 500 km to 5,500 km were prohibited from being deployed on land, though not at sea.

By removing 850 American and 1,700 Soviet missiles, the treaty kept the European theatre free of the destabilising implications of this range of delivery systems. Other vectors of ranges less than 500 km were, of course, deployed but these were deemed battlefield weapons for military targets. Besides, land-based missiles with intercontinental ranges of more than 5,500 km were perceived as providers of deterrence stability.

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development for many years now, in any case. In fact, there has been steady deterioration of the bilateral US-Russia relationship since the failure of an attempt at a reset, the subsequent Russian

annexation of Crimea and the resultant imposition of sanctions by the West, and the more recent allegations of Russian interference in American elections. All of this coalesced with INF treaty violation allegations to exacerbate the demise of the treaty.

This will, of course, have ramifications for the US and Russia’s political relationship. In fact, this will further harden the divide between the two nations and their positions on the modernisation of their nuclear

capabilities.

Movement along these lines had become clear after the release of the US Nuclear Posture Review of 2018. This was soon followed by the State of Union address by President Vladimir Putin. Both leaders struck strident notes that indicated a readiness to develop new weapons systems to re-establish a degree of deterrence that was perceived to have been eroded by developments on the other side. So, the US highlighted an urgent need to fill the “credibility gap in low yield weapons”. This would defeat Russia’s ‘escalate to de-escalate’ strategy, it said. Russia, on the other hand, emphasised its resolve to build an “invincible arsenal” to defeat US ballistic missile defence.

In this politically vitiated environment, it was virtually impossible for the two sides to have had any meaningful conversation to address each other’s concerns on the INF treaty. It has, consequently, fallen by the wayside. However, it cannot be overlooked that the US decision to let that happen also had much to do with the emerging challenge of Chinese nuclear missiles that have been fast moving towards greater technological sophistication.

**The China Factor:** At the time that the INF treaty was concluded, China had not yet emerged as a major player. But during the decades since then, China has steadily progressed in its military (including nuclear) capabilities to amass a large number and variety of mid-range missiles. Driven by US capabilities such as missile defence and the possible use of strategic missiles with

conventional warheads that were seen as eroding its own nuclear deterrence, China contends that its march towards a better and more survivable nuclear arsenal is only to stabilise a relationship that had been rendered off-balance.

Therefore, its focus has been on increasing the accuracy, mobility, penetrability and reliability of its delivery vectors with the help of better space support capabilities. As many as 95% of all Chinese missiles are believed to be within the ranges of the INF treaty, a set of weaponry that the US and USSR/Russia had banned for themselves. Not surprisingly, with growing capability, China’s behaviour too has turned far more assertive and it has not shied away from showcasing its anti-ship ballistic missiles. This could be to deter any interference with its plans for the region that falls within its demarcation of the first island chain.

China has also placed anti-ship cruise missiles of these ranges on the artificially constructed islands in the area. These are clear signals to Washington.

While the US had always had sea-deployed missiles of this range in the region, they did not have the attribute of persistence. With land-based deployments, the US plans to change the picture and offer its own deterrence against China’s possible offensive plans against Taiwan or in South China sea. In the face of this reality, the US is sending two messages by getting out of the INF treaty. One of these, of course, is meant for Moscow. It indicates American intolerance when it comes to sticking with instruments that are being violated. Washington has now shown readiness to bear the risk of shedding even long-

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**The US Nuclear Posture Review of 2018 has identified China as a nuclear adversary and echoed the sentiment that while the US had refrained from taking up nuclear modernisation owing to arms control instruments, ‘others’ had gone on to build new capabilities – Russia by violating existing arms control instruments and China by not being part of any.**

standing mechanisms if they no longer seem to address its security concerns.

The second signal is meant for Beijing. The US Nuclear Posture Review of 2018 has identified China as a nuclear adversary and echoed the sentiment that while the US had refrained from taking up nuclear modernisation owing to arms control instruments, 'others' had gone on to build new capabilities – Russia by violating existing arms control instruments and China by not being part of any.

**What of India?:** The US has now stated the objective of crafting new arms control instruments that would better reflect current nuclear realities. Obviously, it is looking to rope China into such arrangements, which would prove to be useful for India. The problem, however, is that President Xi Jinping has indicated his lack of interest in any nuclear arms control treaty. His position remains that the two major nuclear possessors must first further reduce their nuclear armaments before expecting China's participation. Therefore, if the US was hoping to turn the death of the INF treaty into an opportunity for giving birth to a new instrument, the task looks quite difficult now. Should the demise of the INF treaty matter to India? There are, of course, no direct implications of this.

The treaty was a bilateral arrangement and it was incumbent on the two parties to live up to their commitments. If they have not, there is little that India can do about it. However, there are indirect ripples of this development that could well touch India's shores. For one, a politically vitiated relationship between US and Russia makes India's own bilateral engagement with each country more difficult. American objections to India's acquisition of the Russian S-400 air and missile defence system is just one such instance. The nature of their relationship also makes consensus or a united

approach more problematic on matters of global security, such as the challenges of nuclear terrorism, the political situation in Syria, the nuclear developments in North Korea and Iran, and so on.

Secondly, the collapse of nuclear arms control removes what were largely seen as some foundational treaties, such as the Anti-Ballistic missile treaty and INF, from being examples or anchors for other nuclear dyads to follow. In the current world order inhabited by nine nuclear weapons possessors, each of whom is engaged in advancing its nuclear capabilities to fit their idea

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of credible deterrence, there are no operational arms control models to emulate, except the US-Russia New Start treaty, which too is at present under an ominously grey cloud. At a time when new technologies like cyber offensives, hypersonics, artificial intelligence and machine learning are fast emerging and there is no clarity on how these would intersect with nuclear

deterrence, the lack of an arms control anchor could prove dangerous.

Thirdly, when nations get out of such arrangements, they leave behind a sense of heightened salience of nuclear weapons. Washington and Moscow seem to have voted in favour of new nuclear deployments over acceptance of controls on nuclear arms. With greater value being ascribed to nuclear weapons, proliferation yet again occupies centre stage.

An arms build-up, for now, looks inevitable as major nuclear possessors will make the worst-case assumptions of their adversaries and act accordingly. In conclusion then, the situation in 2019 appears to signal a nuclear world order (many are beginning to call it a disorder) in which nations are engaged in making exaggerated perceptions of each other's capabilities and

intentions. They helped along by liberal doses of hyper nationalism.

At the same time, one can see an unbridled growth of new technologies that look prone to creating an arms race instability and increased risk of stumbling into nuclear escalation. As of now, the situation looks gloomy and none of the nuclear weapon possessors have shown either the plans or the capacity to arrest the tide. The end of the INF treaty has most likely heralded an era of growing salience of nuclear weapons. Will the world have to experience a nerve-racking crisis before the return of sanity?

Source: <https://thewire.in>, 09 August 2019.

**OPINION – Carol Giacomo**

**Can the Democrats Do Better Than Trump on North Korea?**

Over the two years and three meetings that President Trump has engaged with Kim Jong-un, the North Korean leader may have produced fissile material for as many as a dozen more nuclear weapons, according to expert estimates. That's hardly the total denuclearization of North Korea that Mr. Trump promised.

Would his Democratic challengers do a better job? Despite former President Barack Obama's warning upon leaving office that North Korea presented the most urgent national security threat to the United States, the Democrats competing for the 2020 presidential nomination rarely mention North Korea, and the debates so far have given all foreign policy matters short shrift. When the Democrats do talk about North Korea, they are

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more apt to pillory Mr. Trump for currying favour with Mr. Kim than to present alternative policies. So, we asked the seven candidates who scored two percent or more in the RealClearPolitics public opinion poll index to answer questions about how to handle North Korea. All stressed diplomatic solutions and working closely with allies.

Senator Bernie Sanders said that while it was unlikely North Korea would give up its nuclear weapons in the short term, it could be persuaded to do so in the future, and "we need to test

the proposition" with a step-by-step process, which would "take some time."

Bernie Sanders doesn't rule out the possibility that the world may eventually have to accept and manage North Korea as a nuclear weapons state. But he warned that accepting that reality could prompt other countries to develop nuclear arms and lead to a breakdown in international efforts to restrain such weapons. Pete Buttigieg, the mayor of South Bend, Ind., said he rejected the idea of a "zero-sum insistence on full and complete denuclearization before any peace is possible," as Mr. Trump has demanded. He instead

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favoured a process of "small steps leading to bigger ones." He said it's unrealistic to think North Korea would immediately give up the nuclear weapons it sees as the key to its survival.

Mr. Buttigieg outlined a process by which the North would take concrete and verifiable steps toward denuclearization by ceasing production of nuclear weapons materials and forgoing nuclear and missile tests, then dismantling production facilities and test sites, and finally destroying the weapons themselves.

In return, the United States would grant incremental relief from sanctions, encourage peace between North Korea and South Korea and normalize relations with North Korea, he said. Making a case for engaging adversaries, Mr. Buttigieg said he would meet Mr. Kim to close a possible framework agreement setting the terms for negotiations but would not “bathe him in unwarranted compliments,” as Mr. Trump has done.

Senator Elizabeth Warren said she would put her immediate focus on an initial, verifiable agreement to prevent the expansion of North Korea’s arsenal and the transfer of its weapons to other countries. Real reductions in nuclear weapons and missiles and addressing human rights abuses would come later. She said she would meet Mr. Kim “if it is important to advance a substantive negotiation.”

**Mr. Biden’s reluctance to address North Korea beyond a perfunctory promise in his July foreign policy speech to “empower our negotiators and jump-start a sustained, coordinated campaign with our allies and others — including China” toward a denuclearized North Korea is not encouraging given the fact that he has more experience than the others.**

Senator Cory Booker said that while he would empower American diplomats to negotiate with North Korea, “there is no indication that the current relationship between the U.S. and North Korea merits a meeting of the heads of state.” And if such a summit were contemplated, North Korea would first have to meet conditions, such as dismantling the nuclear complex at Yongbyon, agreeing to formally end the Korean War and returning military remains, he said. The responses from Joe Biden, Senator Kamala Harris and Beto O’Rourke added little new to the debate.

In one sense, that is predictable. It’s still early in the campaign and candidates often don’t do the heavy thinking about policy positions until they are forced to debate them publicly. For the moment, the North Korean threat seems to have receded in the public consciousness. According to new data from the Pew Research Centre, 75 percent of Americans saw North Korea as a major threat in 2017 when Mr. Trump was threatening “fire and fury” against the country, but today only

53 percent do.

Mr. Biden’s reluctance to address North Korea beyond a perfunctory promise in his July foreign policy speech to “empower our negotiators and jump-start a sustained, coordinated campaign with our allies and others — including China” toward a denuclearized North Korea is not encouraging given the fact that he has more experience than the others. The Obama administration identified North Korea’s nuclear weapons program as a major threat but failed to find a solution. It tightened sanctions and, after a disappointing diplomatic effort in the first term, effectively gave up on negotiations in the second.

Despite Mr. Trump’s assertions to the contrary, the danger remains real, and many experts, and even some Trump administration officials, worry that the window for progress on a deal is fast closing. While

Mr. Trump continues to act as if his friendship with Mr. Kim has moderated his behaviour, two North Korean missile tests in recent weeks suggest that Mr. Kim may be running out of patience with diplomacy — or never intended to curb his weapons programs at all. Mr. Kim, whose intransigence is largely responsible for the current stalemate, has said he will give Washington until the end of the year to return to the negotiating table. At that point, the American presidential campaign will be in full swing, making serious deal-making even less likely than it already is.

Source: <https://www.nytimes.com>. 05 August 2019.

**OPINION – Steve Holland, Andrew Osborn**

**US Withdraws from Cold War-Era Nuclear Missile Treaty with Russia**

The US formally withdrew from a landmark 1987 nuclear missile pact with Russia after determining that Moscow was violating the treaty, an

accusation the Kremlin has denied. Washington signalled it would pull out of the arms control treaty six months ago unless Moscow stuck to the accord. Russia called the move a ploy to exit a pact that the US wanted to leave anyway in order to develop new missiles.

President Donald Trump told reporters he would like to seal a new arm deal with Russia reducing all nuclear forces, and possibly with China as well. "If we could get a pact where they reduce and we reduce nuclear, that would be a good thing for the world. I do believe that will happen," Trump said.

The Intermediate-range INF was negotiated by then-US President Ronald Reagan and Soviet leader Mikhail Gorbachev. It banned land-based missiles with a range of between 310 and 3,400 miles (500-5,500 km), reducing the ability of both countries to launch a nuclear strike on short notice. The dispute is aggravating the worst US-Russia friction since the Cold War ended in 1991. Some experts believe the treaty's collapse could undermine other arms control agreements and speed an erosion of the global system designed to block the spread of nuclear arms.

"The US will not remain party to a treaty that is deliberately violated by Russia," Secretary of State Mike Pompeo said in a statement. "Russia's non-compliance under the treaty jeopardises US supreme interests as Russia's development and fielding of a treaty-violating missile system represents a direct threat to the US and our allies and partners," Pompeo said.

Senior Trump administration officials, who spoke on condition of anonymity, said Russia had deployed "multiple battalions" of a cruise missile throughout Russia in violation of the pact, including in western Russia, "with the ability to

strike critical European targets." Russia denies the allegation, saying the missile's range puts it outside the treaty. It rejected a US demand to destroy the new missile, the Novator 9M729, known as the SSC-8 by the NATO Western military alliance. Moscow has told Washington the US decision to quit the pact undermines global security and removes a key pillar of international arms control.

China's new ambassador to the UN, Zhang Jun, said China regrets that the US is withdrawing from the treaty and expressed doubt about joining the US and Russia in a nuclear deal. "The US is saying China should be a party in this disarmament agreement, but I think everybody knows that China is not at the same level with the US and the Russian Federation," he said.

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**'Serious Mistake':** Russia said it had asked the US for a moratorium on the deployment of land-based short and intermediate-

range nuclear missiles. "A serious mistake has been made in Washington," Russia's Ministry of Foreign Affairs said in a statement. "We have already introduced a unilateral moratorium and won't deploy land-based short or medium-range missiles, if we get them, in regions where such US missiles are not deployed," it said. President Vladimir Putin has said Russia does not want an arms race and he has promised he would not deploy Russian missiles unless the US does so first.

However, should Washington take such a step, he has said he would be forced to deploy Russian hypersonic nuclear missiles on ships or submarines near US territorial waters. NATO Secretary-General Jens Stoltenberg dismissed Russia's moratorium request, saying it was "not a credible offer" as he said Moscow had already deployed illegal missiles. "There are no new US missiles, no new NATO missiles in Europe, but

there are more and more new Russian missiles," he said.

'We don't want a new arms race'. NATO said it had agreed to a defensive package of measures to deter Russia. That response would be measured and would only involve conventional weapons, it said. NATO's Stoltenberg said there would be "no rash moves" by the alliance which he said, "would not mirror what Russia does."

NATO members Britain and Poland blamed Moscow for the treaty's demise. "Their contempt for the rules-based international system threatens European security," British Foreign Secretary Dominic Raab said on Twitter. European officials had voiced concern that if the treaty collapses, Europe could again become an arena for a nuclear-armed, intermediate-range missile build-up by the US and Russia.

US officials said the US was months away from the first flight tests of an American intermediate-range missile that would serve as a counter to the Russians. Any deployment would be years away, they said. "We are just at the stage of looking at how we might further the development of conventional options," one official said.

Source: <https://thewire.in>, 03 August 2019.

**OPINION – Gwynne Dyer**

**Letting Nuclear Arms Treaty Die a Dangerous Mistake**

The INF Treaty died earlier this month, but there won't be many mourners at the funeral. There should be. The problem the INF was intended to solve, back when US president Ronald Reagan and Soviet leader Mikhail Gorbachev signed it in 1987, was "warning time." Bombers would take many hours to get from Russia to America or vice versa, and even ICBMs would take 30-35 minutes. That would at least give the commanders of

nuclear forces on the side that didn't launch the surprise attack enough time to order a retaliatory strike before they died.

Whereas IRBMs based in Europe could reach the other side's capitals, command centres, airfields and missile launchers in 10 minutes: barely time to tuck your head between your knees and kiss your ass goodbye, as they used to say. The IRBMs put everything on a hair-trigger. You had maybe five minutes to decide if you trusted the data from your radars or your satellite surveillance before you had to decide whether to launch your nuclear counter-strike. Which makes it all the weirder that the Russians took the lead in introducing IRBMs to Europe.

They were called SS-20s, and they put all the capitals of NATO's European members on 10 minutes' notice of extinction. However, Moscow would also have only 10 minutes' warning once the U.S. developed its own IRBMs and based them in Europe (they were called Pershing IIs). But the United States is not in Europe, and only the Soviet Union's ICBMs could reach it.

No matter what happened with IRBMs in Europe, the U.S. would still have a half-hour-plus warning time. The Russians were exceptionally foolish to start this particular bit of the arms race. By the mid-1980s, the Russians were looking for a way out, and Reagan, who hated nuclear weapons, was happy to help them. He and Gorbachev signed the INF Treaty in 1987, banning all land-based ballistic missiles with "intermediate range" (500-5500km). They also banned all land-based cruise missiles of similar range, although the relatively slow-moving cruise missiles never posed a "warning time" problem. The INF Treaty was the first major sign that the Cold War was ending: 2,700 missiles were destroyed in the following two years, and everybody lived happily ever after.

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***So why have they Now Just Let the INF Treaty Die?:***

The Russians have been fiddling around with an existing sea-launched cruise missile that has a range of several thousand kilometres. That's legal at sea, but then they test-fired the same missile from a land-based mobile launcher. They kept that test below the INF-permitted limit of 500 km for land-based cruise missiles, but the test proved that it would work at any range. It's a cruise missile, so it has no effect on warning time, nor would it give Russia any strategic advantage. Why didn't Russian President Vladimir Putin just stop the nonsense, and maybe apologize?

Same goes for the United States: the INF is good value, and the Russian infringement is legally questionable but strategically unimportant. Why haven't you taken the time to sort this out and keep the treaty alive? The reason is China. All the arms-control treaties of the later 20th century was made in a bipolar world: The United States and the Soviet Union were the only players who counted. Now China counts, too, and arms control becomes a "three-body problem." Those are very hard problems to solve.

The sane answer is simply to deal the Chinese in. Beijing doesn't want to live with 10 minutes' warning time, either. It would probably sign up to the INF terms, provided that the U.S. and Russia were willing to grant it parity in other weapons. You could even throw in a new ban on "hypersonic" missiles of intermediate range, which will be otherwise be threatening warning times in a few years. But there are people in Washington, and no doubt in Moscow, who would love to have the option of a no-warning disarming strike on Beijing. You have to kill the INF to achieve that,

because you would need to put land-based intermediate-range ballistic missiles on the ground in Asia. But those people have won the argument, because nobody else cares enough.

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Former U.S. secretary of state George Shultz, who negotiated the INF Treaty, told the Voice of America recently, "When something like the INF goes down the drain almost like nothing, it shows you the degree to which people have forgotten the power of these weapons. One day it'll be too late." It's 30 years since the Cold War

ended, and the insiders in the American and Russian defence establishments who are letting the INF die are betraying our trust. New weapons, new strategies, new threats are the building blocks of their careers, and they have forgotten to be afraid of nuclear war.

So the U.S President Donald Trump, or his national security adviser John Bolton, or Putin, should not be blamed as they are the ones who are only doing their usual belligerent shtick. Rather the careerists, who should know better should be blamed.

Source: <https://www.winnipegfreepress.com>, 10 August 2019.

**OPINION – New Delhi Times**

**Without INF Treaty, World becomes Vulnerable**

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The INF Treaty between the United States and the Soviet Union was signed in 1987 prohibiting both countries from having land-based missiles of 500-5,500 kilometres range. This was the first-ever pact signed between Washington and Moscow on nuclear disarmament and became a

major step forward in restricting the arms race during the Cold War years. Other treaties, dialogue platforms and mechanisms on arms control for strategic balance followed later.



On February 2, Trump administration gave six-month's withdrawal period to suspend the US obligations on the INF and terminated the treaty on August 2. Russia followed the suit shortly thereafter. This has tremendous implications for the US-Russia ties and the world. With INF gone, the New START remains the sole nuclear arms reduction treaty between the US and Russia. Unless extended, it expires in 2021, leaving no control over the nuclear arsenals of two super powers. When both treaties fade into history, strategic stability will become more vulnerable since the US and Russia control over 90 percent of the world's nuclear arsenal. Reducing nuclear stockpile through continuous negotiation will become a distant possibility when the US and Russia free themselves from arms control obligations.

Washington withdrew from INF because Moscow developed advanced ballistic and hypersonic delivery systems in violation of the treaty. Secondly, despite being the world's second-largest economy, and an effective competitor of the US with quality missiles, China has not joined the INF treaty. China, rather than Moscow, contributed more to the US determination to withdraw. The US now seeks a new arms control treaty that will also include China. When Japan suggested a new multilateral nuclear missile treaty to replace the INF, China opposed citing treaty's multilateralization and insisted that the US should first disarm its nuclear arsenal. The US will return to INF only if it is renegotiated including China as a member. But China refuses to join stating its nuclear strategy is for self-defence; committed to no first use and non-participation in arms race; steady nuclear policy over decades; and modest nuclear arsenal compared to America and

Russia.

The strategic environment of East Asia is different from the US and Russia. The US neighbours don't have nuclear weapons while four countries in China's neighbourhood – Russia, India, North Korea and Pakistan – do. Russia's possession of huge tactical nuclear weapons pressurizes China to have, as a major component of its nuclear deterrent, land-based intermediate-range nuclear missiles for its national security. The US propensity of withdrawing from international organizations and treaties is also discouraging. The US counter-argues that China has the most intermediate-range missiles in the world with largest number of weapons prohibited under the treaty and is a major power in the Asia-Pacific region. The US can't silently witness European stability under INF at the expense of weakening American military presence in the Asia-Pacific region. The US has actually deployed many intermediate-range missiles in Asia, Europe and the Indian Ocean, but not on land.

The INF treaty restricts land-based nuclear weapons whereas the US has deployed sea-based conventional and nuclear missiles on its powerful naval vessels. Some Middle East, South Asian and North-East Asian countries have long possessed offensive medium-range missiles. A probable arms race among the US, Russia and China could lead to sub-regional disturbances. The collapse of INF could trigger more regional and sub-regional missile development.

The treaty prohibited only land-based medium-range missiles, which are Russia's strength. However, the US sea-based strategic nuclear

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weapons constitute a strong deterrent to Russia, so the US abandoning its land-based nuclear missiles deployed in Europe will not fundamentally shake its strategic deterrence to Russia. If Washington deploys intermediate range missiles in Europe, Moscow could deploy weapons that can hit America. The fundamental premise of nuclear arms control is strategic stability. So, the absence of INF enhancing vulnerability though potential arms race may never reach the Cold War heights. Washington will deploy more land-based intermediate range missiles in East Asia to deter Beijing, triggering strong resistance from China.

Source: <https://www.newdelhitimes.com>, 12 August 2019.

**OPINION - Jonathan Lesser**

**Can Nuclear Power Be Saved?**

Whither nuclear power? That question has become more important as energy policies evolve to emphasize emissions-free "green" energy and an increased electrification of the U.S. economy. Some environmentalists consider nuclear power to be crucial to reducing carbon emissions; others continue to vehemently oppose nuclear power and believe that our energy must come solely from renewable sources. The public, encouraged into hysteria by dramatizations of nuclear-plant accidents such as the film 'The China Syndrome' and HBO's 'Chernobyl', is split.

Meanwhile, the nuclear-power industry itself is in a parlous state for a variety of tangled reasons. In a recent Manhattan Institute report, I broke them down into four categories: (i) decades of construction cost overruns and plant delays because of poor designs, lack of manufacturing expertise, and changing regulations; (ii) political squabbling over spent-nuclear-fuel disposal; (iii) energy policies, including renewable-energy subsidies and mandates, that have distorted

electric-power markets and made it harder for nuclear plants to compete; and (iv) lower natural-gas prices and more efficient gas-fired generators. In the past few years, threatened plant closures have led state policymakers to award subsidies to eleven existing plants. More such subsidies are likely forthcoming, if for no other reason than some nuclear-plant owners wanting their share of the subsidy pie. "Nice plant you got there," they seem to be saying to local economic stakeholders. "Be a shame if something happened to it."

Nevertheless, nuclear power provides valuable benefits. It is highly reliable and emissions-free. It provides generation diversity, which can reduce the adverse effects of fuel-price shocks. It does not require backup and storage, unlike wind- and solar-power generation. And new designs for nuclear plants promise lower costs and improved safety.

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Then again, the nuclear industry has long promised lower costs — and failed to deliver. When actual construction begins, costs always seem to balloon, owing to a combination of poor manufacturing and changing safety regulations. SCANA Corporation's partially built and now

abandoned Santee Cooper nuclear plant, which led to that company's purchase by Dominion Energy, and Southern Company's delayed Vogtle plant, are just the latest examples.

So what should be done? In part, the answer depends on the future direction of U.S. energy policy. If the country adopts the unicorn and pixie-dust fantasies of the Green New Deal or other policies that mandate decarbonization, the U.S. appetite for energy — especially electricity — will continue to increase. Given current technology and prospects for future innovations, the only realistic way of meeting that demand is nuclear power. As my Manhattan Institute colleague Mark Mills has aptly explained, expecting to meet the needs of an electrified economy solely with wind,

solar, and battery storage is “magical thinking.”

That means the next hurdle is making the nuclear-power industry viable — a technological and political challenge. First, there is cost. Small modular reactors (SMRs), 50 MW in size, promise lower costs thanks to standard designs and modular construction. The most advanced design is by NuScale Corporation, which will provide a complete “nuclear plant in a box” (albeit a 76-by-15-foot, 700-ton box). The first NuScale SMRs are slated to be installed at the Idaho National Laboratory and operational by 2026. Small modular units, if successful, will be small enough to be installed as electricity demand increases, while avoiding the whale-like financial commitments of the current crop of 1,000 MW reactors.

Second, and perhaps most importantly, is permanent storage and disposal of spent fuel. For nuclear power to remain a viable energy technology, this issue must be addressed. In fact, 14 states, including many with nuclear plants currently operating or retired, have prohibitions or restrictions on construction of new plants until a permanent repository for high-level waste has been identified.

Nuclear-waste disposal is not a technological issue, as some critics contend. Rather, it is a political one. Spent nuclear fuel, which remains radioactive for thousands of years, can be disposed of safely. Finland has taken the lead on the issue and is constructing a permanent underground depository. The project has been supported by the government and, most importantly, by the local community. And for good reason. The science supports the safety of their approach. Spent fuel can be safely stored deep underground in stable rock formations, such as the granite bedrock in

which the Finnish site is being constructed.

France, which relies on nuclear power for three-fourths of its electricity, has yet to develop a permanent underground depository, owing to opposition to siting such a facility. However, unlike the US, France reprocesses spent nuclear fuel, which creates additional usable fuel, and puts the remaining nuclear waste in temporary storage facilities. Work on the only federally proposed US permanent waste depository, at Yucca Mountain, Nevada, which began after congressional authorization in 1987, was stopped by the Obama administration and remains opposed by Nevada’s senators and Democratic congressional leaders. Although the Trump administration has proposed to restart the Yucca Mountain project, the bitter opposition is unlikely to abate, rendering prospects for its completion dim.

It seems that the only way the U.S. is likely to solve this political issue is to follow Finland’s approach, of identifying suitable locations and then discussing the prospective repository with the local populace, who may view it as a booster for their economy. For example, the Waste Isolation Pilot Project (WIPP), which stores mid-level nuclear waste and is located just south of Carlsbad, N.M., is strongly supported by the local community because of its economic benefits.

Third, if we must subsidize the current crop of nuclear plants, then those subsidies ought to be as efficient as possible. To begin with, subsidies for wind and solar power ought to be eliminated. Those subsidies help drive down wholesale (but not retail) electricity prices and make it more difficult for existing nuclear plants, along with all other unsubsidized generation, to compete.

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Subsidizing nuclear plants to overcome the market distortions caused by wind and solar subsidies is a recipe for failed wholesale electric markets.

Instead, nuclear subsidies should be tied directly to wholesale power prices. (The technical term is called a "contract-for-differences.") If wholesale electricity prices increase, subsidies are automatically reduced, and vice versa. Additionally, subsidies should require nuclear-plant owners to have "skin in the game," by imposing requirements that those plants increase their operating efficiency over time. Moreover, before other nuclear plants are subsidized, they should be subject to a comprehensive cost-benefit analysis that affirmatively answers the key question: "Can this plant be saved?" We ought not to toss ratepayer and taxpayer dollars at plants that have little or no prospect of improved performance or economic viability.

What about broad-based carbon taxes and carbon "border tax adjustments," such as those called for under the Climate Action Rebate Act of 2019, introduced last month by Senators Coons (D., N.J.) and Feinstein (D., Calif.)? Although, in theory, broad-based carbon taxes would be the most economically efficient approach to saving nuclear plants, it is not so in practice. The carbon taxes envisioned by the Coons-Feinstein legislation would likely wreck the U.S. economy, encourage international economic retaliation, and have little or no measurable effect on the climate. (Developing countries, after all, are unlikely to abate carbon use, and their carbon footprint affects global net emissions just as much as ours does.)

As electricity becomes ever more important to the U.S. economy, with many politicians demanding electrification to combat climate change, nuclear power should take center stage because it is both clean and reliable. Wind and solar generation will not be able to meet the increased demand of

electrification, because the land and battery storage requirements are unrealistic and technologically infeasible. Nuclear-plant subsidies, carefully crafted, are the best answer to ensure that the nuclear industry survives and evolves to finally meet expectations, after decades of broken promises.

*Source: <https://www.nationalreview.com>, 14 August 2019.*

**OPINION – George Shultz, Lee Hamilton**

**Our Efforts to Prevent Nuclear Terror are Shrinking. The Threat is not.**

Few have done more to prevent the spread of nuclear weapons and materials than the late Sen. Richard Lugar, R-Indiana, who passed away in April. Our current generation of lawmakers must not take the legacy of bipartisan leadership he left behind for granted – it is in grave danger.

**Wind and solar generation will not be able to meet the increased demand of electrification, because the land and battery storage requirements are unrealistic and technologically infeasible. Nuclear-plant subsidies, carefully crafted, are the best answer to ensure that the nuclear industry survives and evolves to finally meet expectations, after decades of broken promises.**

Despite progress made at four Nuclear Security Summits between 2010 and 2016 to address the existential threat of nuclear terrorism, a new report from Harvard University's Managing the Atom Project warns that "High-level political attention to nuclear security and

overcoming obstacles has largely faded, international mechanisms for fostering nuclear security action and cooperation have not managed to fill the gap created by the absence of nuclear security summits, and political disputes continue to impede efforts to sustain or expand cooperation in crucial areas."

Recent years have seen an erosion of congressional expertise and experience on preventing nuclear terrorism, while successive administrations have proposed to shrink spending on core nuclear material security and nonproliferation programs. Last July, a first-ever study assessed congressional attitudes on nuclear security. Undertaken by the Arms Control

Association and Partnership for a Secure America, the study found that effective congressional oversight of this issue has been constrained in recent years by numerous obstacles, including limited institutional knowledge, misunderstanding of the subject, skepticism of mission need, competing priorities, and funding constraints.

Yet historically, Congress has been the source of bipartisan innovation and the key supporter of efforts to advance global nuclear security. Senator Lugar, along with Sen. Sam Nunn, D-Georgia, embodied this reality as the architects of the Nunn-Lugar Cooperative Threat Reduction program, which from 1992 to 2012 deactivated 7,500 nuclear warheads and 2,000 intercontinental ballistic missiles in Russia and the states of the former Soviet Union. Even in recent years, bipartisan leaders like Sen. Dianne Feinstein, D-Calif., Sen. Lamar Alexander, R-Tennessee, and Rep. Marcy Kaptur, D-Ohio, have championed sizable funding increases for nuclear security programs.

But the global nuclear security enterprise is at a critical crossroads. While the worldwide use of nuclear and radiological materials has grown, including in unstable regions of the world, and emerging technologies such as additive manufacturing and offensive cyber tools pose new challenges, the issue of nuclear security has all but faded from the US national conversation. As these materials become more widespread, they will be vulnerable to criminal and terrorist organizations without sufficient security efforts.

Unfortunately, for the third year in a row, the Trump administration is proposing to reduce funding for core U.S. nuclear security and nonproliferation programs at the semiautonomous National Nuclear Security Administration.

In addition, the Los Angeles Times recently found that the administration has scaled back or ended

programs at the Department of Homeland Security designed to combat chemical, biological, radiological and nuclear threats.

That's why we and 30 other former high-ranking government officials representing both political parties, including Sen. Lugar, signed a statement earlier this year urging immediate Congressional action to step up efforts to secure nuclear and radiological materials globally to prevent any

possibility of a nuclear terrorist attack. We recommend these five courses of action:

1. The Office of Management and Budget should be required to prepare an annual report summarizing the aggregate U.S. budget for nuclear security and non-proliferation programs;

2. A blue ribbon, bipartisan congressional commission should be established to develop a comprehensive strategy to prevent, counter, and respond to nuclear and radiological terrorism;
3. A program of activities should be designed to prevent nuclear theft and trafficking in North Korea;
4. Periodic hearings should be held with government and non-governmental nuclear security experts; and
5. A sustained effort should be pursued to promote a mandatory international system of monitoring, reporting, and accountability in all countries with nuclear and radiological materials and the facilities that house them.

Some members of Congress are heeding the call. For example, we applaud Rep. Jimmy Panetta, D-Calif., and Rep. Chuck Fleischmann, R-Tennessee, for recently introducing the "Nuclear Security and Nonproliferation Accounting Act," which would direct the Government Accountability Office to

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submit annual reports on the budget for international and domestic nuclear security programs of the United States. Programs to prevent nuclear and radiological terrorism are spread throughout the government; a consolidated summary would offer a clear picture of gaps and overlaps.

As the nation continues to mourn the passing of a statesman who made crucial contributions to reducing nuclear threats, it is the responsibility of his successors in Congress to sustain and build on the legacy they have inherited.

Source: <https://www.defenseone.com>, 13 August 2019.

## NUCLEAR STRATEGY

### CHINA

#### China's Position on the US Withdrawal from the INF Treaty

On August 6, 2019, H. E. Mr. Li Song, Chinese Ambassador for Disarmament Affairs, presented China's position and proposition on the US withdrawal from the INF Treaty at the Conference on Disarmament.

Li expressed that China deeply regrets and firmly opposes the US practice of insisting on withdrawing from the INF Treaty in disregard of international opposition. Since the US officially announced its withdrawal on August 2, senior officials of the US Defense Department have publicly stated that the US will seek to resume the development and deployment of the intermediate-range missiles. This fully demonstrates that the

**If the US adopts the above irresponsible unilateral measures, it will severely undermine global strategic balance and stability, intensify tensions in international relations, undermine strategic mutual trust of major countries, disrupt international nuclear disarmament and arms control processes, and threaten peace and security in relevant regions.**

withdrawal from the INF Treaty is another negative move by the US to pursue unilateralism in disregard of its international commitments. Its real intention is

to make the Treaty no longer binding on itself so that it can unilaterally seek military and strategic edge. If the US adopts the above irresponsible unilateral measures, it will severely undermine global strategic balance and stability, intensify tensions in international relations, undermine strategic mutual trust of major countries, disrupt international nuclear

disarmament and arms control processes, and threaten peace and security in relevant regions. Like the vast majority of members of the international community, China is deeply concerned about the above-mentioned negative developments.

Li said that China noted that while withdrawing from the INF Treaty, the US declared that the US-Russian bilateral nuclear disarmament era has ended, and once again raised the issue of China's participation in multilateral nuclear arms control negotiations with the US and Russia. The US claim is a complete diversion from international attention. China has no intention to participate in such

negotiations and will not be made part of it. He stressed that China's nuclear strategy for self-defence is completely transparent, its nuclear policy is highly responsible, its nuclear arsenal is extremely limited in scale, and never poses threats to international peace and security. China did not, does not and will not engage in any nuclear arms race with any country.

Li called on the international community to stay clear of the grave consequences of

the US withdrawal from the INF Treaty, and to

**Li called on the international community to stay clear of the grave consequences of the US withdrawal from the INF Treaty, and to prevent the US from shifting its own special and primary responsibilities in nuclear disarmament under any pretext. He urged the US to exercise restraint, not to take actions that undermine the security interests of other countries, fulfil its due international responsibilities as a major power and earnestly safeguard the global and regional peace and security.**

prevent the US from shifting its own special and primary responsibilities in nuclear disarmament under any pretext. He urged the US to exercise restraint, not to take actions that undermine the security interests of other countries, fulfil its due international responsibilities as a major power and earnestly safeguard the global and regional peace and security. He stressed that this is the common voice of the international community.

**China warned it would “not stand idly by” if the United States deployed ground-based missiles to Asia, as a bruising trade war and strained relations fuelled fears of an arms race between Beijing, Washington and Moscow.**

Li pointed out that China supports and encourages the US and Russia to maintain dialogue on strategic security and bilateral nuclear disarmament issues and make their necessary efforts to extend the New START. The differences between the US and Russia on the implementation of the nuclear disarmament treaties should be resolved through dialogue and negotiation. It is neither right nor possible to address them by withdrawing from or breaching the treaties. As the powers possessing the largest nuclear arsenals, the US and Russia are obliged to continue substantially reducing their nuclear arsenals in a verifiable, irreversible and legally binding manner. It is the important guarantee for maintaining global strategic stability, international peace and security, and the international arms control and non-proliferation regime, which will also create the necessary conditions for advancing the multilateral nuclear disarmament process.

*Source: www.china-un, 06 August 2019.*

### **China Warns US Against Sending Missiles to Asia Amid Fears of an Arms Race**

China warned it would “not stand idly by” if the United States deployed ground-based missiles to Asia, as a bruising trade war and strained relations fuelled fears of an arms race between Beijing, Washington and Moscow. A Chinese arm control

official, Fu Cong, delivered the warning three days after the American defence secretary, Mark Esper, said he favoured deploying such missiles to the region “sooner rather than later.” Mr. Esper did not give an exact timeline or a possible base for the missiles, but suggested it would take months, potentially 18 or more, to field the weapons.

“We call on the U.S. to exercise restraint,” Mr. Fu said in a Foreign Ministry

statement. “China will not stand idly by and will be forced to take countermeasures if the U.S. deploys intermediate-range ground-based missiles in this part of the world.” Mr. Fu did not specify what countermeasures China would take

**Russia has denied violating the INF and objected to the American withdrawal, but expressed interest in new negotiations. Explaining China's resistance to those talks, Mr. Fu cited the disparity in weapons stockpiles, saying, “I do not think it is reasonable or even fair to expect China to participate in any nuclear reduction negotiations at this stage.**

in response to a deployment. He did say, though, that China had “no interest” in arms control talks with the United States and Russia — a step toward President Trump's ambition of a three-way nuclear accord.

The Trump administration has argued that Russian-American arms agreements are outdated

in the context of a rising China, and the United States formally pulled out of the Intermediate-Range Nuclear Forces Treaty of 1987, or I.N.F., on the grounds of Russian violations. Mr. Fu said the American withdrawal from the treaty would have “a direct negative impact” on global stability and security, and called it a “pretext” for an American weapons build-up.

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Together, the United States and Russia hold more than 90 percent of the world's nuclear weapons, according to the Federation of American Scientists, a non-profit based in Washington. The group estimates that the United States has about 1,750 deployed warheads, Russia has about 1,600 and China about 290. According to Mr. Fu, China took part in multilateral discussions on arms, and that it would "not participate in any nuclear arms race."

Chinese protests have done little to quell fears of a new global arms race. On 6 August, a former energy secretary in the Obama administration, Ernest J. Moniz, and a former Georgia senator, Sam Nunn, published an article in Foreign Affairs warning that a "toxic mix of decaying arms control and new advanced weaponry" have made a nuclear exchange between Russia and the United States "disturbingly plausible." "Its essential elements are already present today; all that is needed is a spark to light the tinder," they wrote.

American officials have repeatedly warned about Chinese and Russian build-ups. Lt. Gen. Robert P. Ashley Jr., the director of the Defence Intelligence Agency, said in May that China was likely to diversify and "at least double the size of its nuclear stockpile" over the next decade. Russia's nuclear stockpile was "likely to grow significantly," he said.

The Trump administration has also made efforts to modernize its stockpile, releasing a plan last year about how it could improve the American arsenal, including tactical nuclear weapons. Although Mr. Esper, the defence secretary, has proposed sending conventional missiles — not nuclear warheads — to Asia, the Trump administration's approach still threatened to raise tensions all over the Pacific, said Kingston Reif, the director for disarmament at the Arms Control Association, a non-profit organization.

"The United States ought to maintain appropriate military readiness in the face of the growing China challenge in the region, but we can't missile our

way out of this challenge," he said, noting that China could respond by fielding more weapons or targeting American allies for economic retaliation. "China's certainly not blameless here," he added. "China has deployed hundreds of missiles of this range, and shunned engaging in meaningful arms control talks and discussions with the United States." President Trump may also let the New Start treaty, an arms agreement with Russia, expire in February 2021 rather than renew it for five years. Its expiration would mean "there would be no limits on the nuclear arms of the U.S. or Russia for the first time in nearly 50 years," Mr. Reif said.

Experts say the most likely locations for an American deployment would be South Korea or Japan, although Tokyo has recently been improving its relations with China. Prime Minister Scott Morrison of Australia said that his country would not host American intermediate-range missiles. According to Mr. Fu, the deployment of

**China has flexed its economic muscles in the past to punish American allies. After South Korea let the United States install an antimissile system there, China called for a wide boycott of South Korean products and railed against its neighbour for more than a year.**

missiles to an American ally in the Pacific would be like "deploying missiles at the doorsteps of China." Even on the American territory of Guam, he said, a deployment would be "a very provocative action" and could be "very dangerous." He also added a warning to American allies in the region, naming Japan, South Korea and Australia. China called on "our neighbouring countries to exercise prudence and not to allow U.S. deployment on its territory," he said, "because that will not serve the national security interests of these countries."

China has flexed its economic muscles in the past to punish American allies. After South Korea let the United States install an antimissile system there, China called for a wide boycott of South Korean products and railed against its neighbour for more than a year. Since then, Chinese-American relations have only deteriorated in the wake of a two-year trade war that has battered both countries and sown mutual distrust.

*Source: <https://www.nytimes.com>, 06 August 2019.*



## RUSSIA

### Russia Flies Nuclear-Capable Bombers to Region Nearest to Alaska

Russia had flown two nuclear-capable TU-160 bombers to a far eastern Russian region opposite Alaska. State media called the operation a training exercise that demonstrated the country's ability to position nuclear arms close to the United States, according to Reuters. The operation comes amid increased tensions over arms control between Moscow and Washington. Earlier this month, the United States withdrew from the Reagan-era Intermediate-Range Nuclear Forces Treaty, a landmark nuclear missile pact with Russia. The Trump administration said Moscow had violated that treaty. "Russia is solely responsible for the treaty's demise," U.S. Secretary of State Mike Pompeo said in a statement on August 2. He accused Russia of failing to destroy its SSC-8 or 9M729 ground-launched, intermediate-range cruise missile systems, which the United States says are noncompliant.

The Kremlin denied the United States' accusation. The U.S. ambassador to Moscow reportedly said earlier that the New Strategic Arms Reduction Treaty, the last major nuclear pact between Russia and the United States, was outdated and flawed. The ambassador suggested the treaty could be scrapped upon its expiration in 2021 and replaced with something else.

If it is neither extended nor replaced, "there will be no legally binding limits on the world's two largest strategic arsenals for the first time since 1972," according to The Arms Control Association, a Washington, D.C.-based nonprofit. And it seems like (14 Aug) Wednesday's events could foreshadow such an eventuality.

The Kremlin said that it was winning the race to

develop modernized nuclear weapons, Reuters reported. But it was just that a mysterious rocket accident in northern Russia killed at least five people and caused a brief spike in radiation levels. Neither Russia's defense ministry nor its state nuclear agency, Rosatom, clarified the type of rocket that exploded August 8. The agency did say the explosion happened while testing "isotope power sources within a liquid propulsion system." Experts believed it was probably a nuclear-powered cruise missile known in Russia as Burevestnik and by NATO as Skyfall.

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Last week, Russia's military reportedly took another step in its effort to field armed drones for front-line missions. Footage released by Russia's defense ministry showed a combat drone dubbed "The Hunter," known in Russian as Okhotnik, circling an unnamed airfield several times and landing after 20 minutes. State-run news

agency Tass said the Sukhoi S-70 Okhotnik-B possessed the "most advanced reconnaissance equipment."

Source: Hayley Prokos, <https://www.newsweek.com/>, 14 August 2019.

## BALLISTIC MISSILE DEFENCE

### USA-NORTH KOREA

#### North Korea Fires More Ballistic Missiles Ahead of US-South Korea Military Drill

North Korea launched two short-range ballistic missiles into the sea between the Korean Peninsula and Japan, days before the United States and South Korea were scheduled to begin a joint military exercise. The launch marked the fourth test of projectiles in 13 days by North Korea.

The two missiles were fired from a province in the southwest of North Korea and flew 280 miles before splashing into waters off the North's east

coast, the South Korean military said in a statement. The missiles looked like the short-range ballistic missiles that North Korea had fired on July 25, South Korean defence officials said, after analysing their trajectory and other flight data.

In that test, North Korea launched two missiles that were similar to Russia's Iskander short-range ballistic missile. North Korea said at the time that it had launched guided missiles that would be harder to intercept because they could be maneuvered during their flights. Solid-fuel and road-mobile missiles like the Iskander

would present a potent challenge to the missile defence system being built by the United States and South Korea. Such missiles are easier to transport and hide and take less time to prepare to launch.

South Korean officials have said that in all four of the tests that began on July 25, North Korea had launched short-range ballistic missiles. Under a series of United Nations resolutions, North Korea is banned from developing or testing ballistic missiles.

But North Korea has said its recent tests are of new types of tactical guided missiles and large-calibre multiple rocket launchers. North Korea has cited various reasons for its recent resumption of weapons tests, including the modernization of its military. With the tests, North Korea could also be signalling its opposition to the joint military drill scheduled to begin this week. Last month, it warned that if the United States and South Korea did not cancel the drill, it might scuttle efforts to resume dialogue with Washington and even resume nuclear and long-range missile tests.

North Korea routinely condemns joint military drills

by the South and the United States, calling them rehearsals for invasion, and has often countered them with its own missile and other weapons tests.

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our stand to resolve the issues through dialogue" but that the impending joint military exercise was a hindrance to further talks.

"The prevailing situation is dramatically dampening down our desire for implementing the D.P.R.K.-U.S. agreements and the inter-Korean agreements, which also affects the prospect of

**The US and South Korean authorities know too well that the joint military exercise will cause a backlash from us," a spokesman for the North Korean Foreign Ministry said in a statement. "We are compelled to develop, test and deploy the powerful physical means essential for national defence.**

"The US and South Korean authorities know too well that the joint military exercise will cause a backlash from us," a spokesman for the North Korean Foreign Ministry said in a statement. "We are compelled to develop, test and deploy the powerful physical means essential for national defence." The spokesman added that North Korea remained "unchanged in

future dialogue," the spokesman said. "There is no need to have a fruitless and exhausting dialogue with those who do not have a sense of communication." The DPRK stands for the North's official name, the Democratic People's Republic of Korea.

The American secretary of defence, Mark T. Esper, said that the Pentagon was not going to "overreact" to the latest North Korean test. "The key is to keep the door open for diplomacy," Mr. Esper told reporters during a flight to Tokyo. He pointed to President Trump's meeting in June with Kim Jong-un, the North Korean leader, as a positive development. Mr. Esper added that the United States had no plans to scale back future military exercises with South Korea in response

to the North Korean tests.

Mr. Trump and Mr. Kim held their first summit meeting in Singapore in June last year, producing a vaguely worded agreement in which North Korea committed to “work toward complete denuclearization of the Korean Peninsula” in return for “new” relations with Washington. Separately, Mr. Kim met with President Moon Jae-in of South Korea three times last year, producing agreements to reduce military tensions between the two Koreas. After the Singapore meeting, Mr. Trump vowed to halt major joint military drills with South Korea. But the South Korean and American militaries have continued to hold smaller and reconfigured joint drills that they say are necessary to maintain their defensive postures.

When Mr. Kim and Mr. Trump met for a second time in Hanoi, Vietnam, in February, they failed to agree on how to start dismantling the North’s nuclear program. The two leaders met again, briefly, on the border between the two Koreas on June 30 and agreed to resume staff-talks to narrow their differences. But such talks have yet to begin. Mr. Trump has played down the significance of the North’s recent tests, calling them “smaller ones” that did not involve a nuclear weapon or intercontinental ballistic missile. He said he was still getting along “very well” with Mr. Kim.

Source: <https://www.nytimes.com>, 05 August 2019.

## NUCLEAR ENERGY

### AUSTRALIA

#### Fission for Energy: Should Australia be Looking at Nuclear Energy?

Last year Australia sold more than 7,000 tonnes of uranium, at a value of nearly A\$600 million. This uranium produced nearly as much energy as

Australia uses in a year, but with less than 10% of the carbon dioxide from coal-fired power stations. Geoscience Australia has estimated Australia could mine up to 1.27 million tonnes of uranium at a reasonable cost. At the current export rate this would last for more than 150 years.

The question of whether Australia could be using all this uranium more efficiently – as a low-carbon and reliable alternative domestic power source – will no doubt be discussed in an inquiry set up by federal energy minister Angus Taylor. The parliament’s environment and energy committee will consider the economic, environmental and security repercussions of nuclear power in

Australia. The committee’s advice is expected before Christmas.

The inquiry will build on a 2006 report on nuclear power initiated by Prime Minister John Howard and the suggestions from a 2016 royal commission in South Australia on the nuclear fuel cycle. While we wait for the committee’s report, past investigations and what we know about the nuclear

industry leads us convincingly to two basic conclusions: enriching uranium in Australia is not economically feasible, but storing nuclear waste is.

**Nuclear Fuel Needs Processing:** Unlike coal, which can be used in a power station without much processing, nuclear reactors cannot simply be fuelled with uranium ore. The nuclear fuel cycle begins when mined uranium ore is converted to yellowcake, which contains about 90% uranium oxides. This is the only step of the nuclear fuel cycle that already exists in Australia. It is profitable, but expanding exports is unlikely. International demand and uranium prices are flat due to the decommissioning of old European power stations and only modest growth in Asia. While this may change over the next two or three decades, at the moment the commercial opportunities for selling more uranium do not exist.

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**Enriching Uranium in Australia is not an Option:** nuclear reactors in Australia would at least initially be much more expensive.

After being sold overseas, Australian yellowcake is converted to uranium hexafluoride in one of a few global facilities. Next is enrichment, when the crucial fissile isotope U-235 is increased from a natural concentration of 0.7% to an artificial 3-4%. Finally, the enriched uranium is incorporated into zirconium alloy fuel elements.

**After being sold overseas, Australian yellowcake is converted to uranium hexafluoride in one of a few global facilities. Next is enrichment, when the crucial fissile isotope U-235 is increased from a natural concentration of 0.7% to an artificial 3-4%. Finally, the enriched uranium is incorporated into zirconium alloy fuel elements.**

The main argument for nuclear power in Australia is therefore that it can provide low-carbon power with little changes required to the existing distribution network of poles and wires. In contrast, renewables such as wind and solar require significant upgrades

to this network – including massive infrastructure projects like Snowy 2.0 – and a stronger focus on demand management. The considerable improvement of renewable technologies in recent years has brought the cost down to levels competitive with coal and nuclear. However, the infrastructure costs of replacing coal-generated electricity with renewables could be huge. These costs may possibly exceed those of building nuclear power stations.

**This Processing Often Happens in Multiple Countries:** Australian uranium may, for example, be bought by a Japanese power company, shipped to Canada for conversion, be enriched in France, and then incorporated in fuel elements for a reactor in Japan. To prevent Australian uranium ending up in nuclear weapons, the Department of Foreign Affairs and Trade has complex safeguards to keep track of it all. The South Australian royal commission considered the possibility of enriching uranium in Australia, which would in principle vastly increase its value. But the commission found that while Australia could easily build the technical capacity, the global market is already oversupplied. There is currently no commercial market for more enriched uranium, and it's unlikely to grow significantly.

**Storing Radioactive Waste Makes Ethical, Environmental and Commercial Sense:** While nuclear power in Australia has a somewhat shaky business case, a much stronger argument can be made for the back end of the nuclear fuel cycle: storing nuclear waste. Australia's incredibly stable geology offers the opportunity to build a radioactive waste disposal facility similar to the

**Nuclear Reactors are Expensive, but Renewables Need More Poles and Wires:** Every part of the nuclear fuel cycle, apart from mining ore and turning it into yellowcake, takes place overseas. Nuclear power in Australia would effectively be an import business. This can be expected to considerably add to costs that are not at all balanced by Australia's natural abundance of uranium ore. Compared with countries such as France or the UK, which have established nuclear industries and pre-processing facilities, operating

**While nuclear power in Australia has a somewhat shaky business case, a much stronger argument can be made for the back end of the nuclear fuel cycle: storing nuclear waste. Australia's incredibly stable geology offers the opportunity to build a radioactive waste disposal facility similar to the repository under construction in Onkalo in Finland.**

repository under construction in Onkalo in Finland. Pursuing this option would complement Australia's uranium exports, as nuclear fuel would be taken back once exhausted. Such a repository would in fact give a new marketing edge to the successful yellowcake business.

It also addresses Australia's responsibility for any environmental consequences of sending uranium into the world. Importantly, supplying the world's carbon-free nuclear reactors and managing their waste responsibly could be an

important plank in Australia's efforts to reduce carbon emissions. It would not be surprising if the current inquiry in federal parliament suggests a radioactive waste repository is the necessary condition for contemplating any domestic nuclear electricity generation. The successful and profitable operation of such a disposal facility in Australia might provide the strong argument for building nuclear power reactors that is presently lacking.

Source: <https://psnews.com>, 12 August 2019.

## **CHINA**

### **Nuclear Power Efforts Gather Speed**

China's growing clean power demand has boosted the rapid development of nuclear power in the country, making it among the few in the world to have independently developed third-generation nuclear power technology, with a complete industry chain, industry experts said. The first two reactor units using China's homegrown third-generation nuclear reactor technology Hualong One, or the No 5 and 6 reactors in Fuqing Nuclear Power Plant in Fuzhou, Fujian province, are expected to avoid time overruns, creating a record in the construction of the first reactor in a nuclear power project.

Currently, key goals in the construction of the No 5 reactor have all been fulfilled on or ahead of schedule, while devices necessary for the No 6 reactor have been prepared as per schedule, said Zhou Saijun, deputy chief engineer of the power plant affiliated to China National Nuclear Corp, or CNNC.

Hualong One technology, jointly designed by CNNC and China General Nuclear Power Group,

adopts a double-layered containment system that can withstand large aircraft attacks, and has a water tank above the reactor that can be gravity-fed to keep the reactor cool. Fuqing's No 5 reactor will start hot functional tests before Oct 16 and is expected to go into commercial operation in July next year. The No 6 reactor is scheduled to start cold functional tests next April and slated to commence commercial operations in 2021, Zhou said.

Cold functional tests are carried out to confirm whether the circuit system and its supporting facilities are properly installed and ready to operate under high-pressure conditions. A hot functional test is a critical pre-operational test that simulates the temperatures and pressures the reactor systems will be subjected to during normal operation. The No 2 and 3 nuclear reactors in Karachi, Pakistan, using Hualong One technology, are also making construction progress as per schedule.

Zhu Hongwei, deputy Party chief of the nuclear power plant, said the four reactors are the world's first-ever third-generation pressurized water reactors that are being built without any time overruns. Zheng Mingguang, president of Shanghai Nuclear Engineering Research and Design Institute Co Ltd, an affiliate of the State Power Investment Corp, said China has accumulated precious experiences and capabilities in nuclear power project design, construction, and operation over the past few decades.

By the end of June, China had 47 reactors in operation with a capacity of about 48.73 million kW, and the nuclear power plants produced about

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160 billion kWh of electricity in the first half of 2019, up 23.09 percent year-on-year and accounted for 4.75 percent of the total electricity generated in China, according to the China Nuclear Energy Association. "We used to lag behind, but thanks to efforts of several generations of researchers, China is now among the few countries in the world to have a comprehensive third-generation nuclear power industrial chain," said Zheng, who is also chief engineer of CAP1400, a third-generation nuclear reactor technology developed by the institute.

China is among the best in the world's nuclear power industry, with distinct competitive advantages to export nuclear power projects, he said. CAP1400 utilizes proven technologies and takes advantage of superior design features to reduce costs and meet high safety requirements, he said, adding China is able to design and manufacture key equipment and materials. Over 85 percent of components and devices of CAP1400, including key ones such as steam generators, pressure vessels, accumulators, and squib valves, can be domestically manufactured, thanks to efforts and innovations from both State-owned and private Chinese companies, while the rest can be sourced from multiple foreign suppliers, according to Zheng. He Yanqing, Party secretary of Shanghai Electric Nuclear Power Group, a leading Chinese nuclear power equipment producer, said huge market demand is the main driving force for the development of nuclear power technologies in China.

Both Zheng and He believe nuclear power will play a larger role in China's green energy mix, as China is committed to reducing carbon emissions and increasing energy accessibility. Zheng said nuclear energy is the only form of energy that can provide carbon-free and large-scale stable power, compared with other forms of clean energy, such as wind and solar power. He said nuclear energy could also be a disrupter for energy services in heating, hydrogen, desalination and other new applications in China

beyond electricity. The institute is also working on application of digital technologies within the whole life cycle of a nuclear power plant, combined with artificial intelligence, to maintain and ensure safety and reliability.

*Source: <http://www.ecns.cn>. 06 August 2019.*

## **GENERAL**

### **This Nuclear Reactor could be Shipped to Mars by 2022**

Members from the Kilopower project — a NASA and Department of Energy co-initiative working to develop fission power systems for future space exploration — says that one of its reactor could be ready to be shipped to Mars or another distant

location by 2022. "I think we could do this in three years and be ready for flight," project lead Patrick McClure said late last month, as quoted by Space.com, during a presentation. NASA, however, has yet to officially announce any timeline for the project.

**A mobile nuclear power system could keep the lights on for astronauts travelling to the Moon or Mars. Kilopower's prototype is about the size of a fridge and fits into a rocket. It could provide a base with around 40 kilowatts of power — roughly enough electricity for eight houses on Earth.**

A mobile nuclear power system could keep the lights on for astronauts travelling to the Moon or Mars. Kilopower's prototype is about the size of a fridge and fits into a rocket. It could provide a base with around 40 kilowatts of power — roughly enough electricity for eight houses on Earth. It wouldn't be the first time nuclear energy was harnessed in space. Many of NASA's spacecraft have used nuclear energy for propulsion and operation, including Curiosity, NASA's Mars rover that launched in 2011.

Kilopower has successfully carried out ground tests in 2017 and 2018, but has yet to try any experimental fission reactor in space. But previous tests have had positive results. During the 2018 test, the Kilopower Reactor Using Stirling Technology generator converted fission heat into electricity at 30 percent efficiency, according to Space.com. That's a lot more than the conventional seven percent of previous spacecraft power generators.

Source: Victor Tangermann, <https://futurism.com>, 12 August 2019.

**INDIA**

**10 Achievements in Atomic Energy Sector (2019)**

The remarkable achievements in the nuclear power sector include:

1. Setting of World Record in continuous operation of 962 days by Unit-1 of Kaiga Generating Station among nuclear power plants of all technologies.
2. Completion of 50 years of safe operation of Units 1&2 of Tarapur Atomic Power Station (TAPS-1&2), which are currently the oldest reactors in operation in the world.
3. Addition of a nuclear power capacity of 1000 MW by completion of KKNPP- 2 at Kudankulam, Tamil Nadu.
4. First Pour of Concrete (FPC) in KKNPP-3&4 (2X1000 MW) at Kudankulam, Tamil Nadu.
5. Ground break for KKNPP - 5 & 6 (2 X 1000 MW) at Kudankulam, Tamil Nadu.
6. Environmental clearance from MoEF&CC for setting up nuclear power plants at Chutka in Madhya Pradesh.
7. Accord of administrative approval and financial sanction of - ten (10) indigenous 700 MW Pressurized Heavy Water Reactors (PHWRs) to be set up in fleet mode & two (02) units of Light Water Reactors (LWRs) being set up in cooperation with Russian Federation.
8. Entering into enabling agreements with foreign countries for nuclear power cooperation including supply of fuel.

**To deal with rapidly rising costs and other difficulties, four major companies are considering jointly constructing and operating nuclear power plants, sources said. Tokyo Electric Power Co. Holdings Inc., Chubu Electric Power Co., Hitachi Ltd. and Toshiba Corp. are aiming to reach a basic agreement in late August toward the joint plan, according to the sources.**

9. During the three years (July 2016 to June 2019), AMD has augmented atomic mineral resources as detailed below.
10. 80,221 tonne (t) in-situ uranium oxide (U3O8). The total uranium resources of the country is 3,20,445t in situ U3O8 (2,71,737 t U).
11. 108.28 million tonnes beach sand heavy minerals resources, thereby updating the country's beach sand heavy mineral resources to 1173.07 million tonnes.

12. 3,46,462 tonne Rare Earth Elements Oxide and 19,564t Nb2O5 (Niobium Oxide) is estimated in Ambadongar area, Chhota Udepur district, Gujarat.

13. Uranium Corporation of India Ltd. (UCIL) has commissioned the Tummalapalle Uranium mining and milling project in Andhra Pradesh in January 2017.

Source: <https://www.energysector.in>, 14 August 2019.

**JAPAN**

**4 Companies Consider Jointly Operating Nuclear Power Plants**

To deal with rapidly rising costs and other difficulties, four major companies are considering jointly constructing and operating nuclear power plants, sources said. Tokyo Electric Power Co. Holdings Inc., Chubu Electric Power Co., Hitachi Ltd. and Toshiba Corp. are aiming to reach a basic agreement in late August toward the joint plan, according to the sources. Since the accident at the Fukushima No. 1 nuclear power plant in 2011, nuclear power generation businesses have been struggling. Subsequently, the four firms are aiming to maintain their businesses by jointly tackling the costs, they said.

However, since there is a difference of opinion

among the four companies about how to realize joint operations, it is uncertain whether the plan will become a reality, they added. Since the summer of 2018, executives of the four companies have regularly held meetings with officials of the Ministry of Economy, Trade and Industry to discuss the plan.

Each of the four firms have tackled construction or operation of boiling water reactors, the same type as those used in the Fukushima No. 1 plant. Since the 2011 nuclear accident at the plant, electric power companies have been facing difficulties in restarting operations of existing reactors. Construction of new reactors is also difficult. In addition, electric power companies' costs for new safety measures have risen sharply. As a result, their interests have clashed with those of electric power plant manufacturers.

The situation has become one of the factors that have led the four firms to consider jointly constructing and operating nuclear power plants. As for its nuclear power generation businesses, Tokyo Electric Power Co. said in its management reconstruction plan worked out in 2017 that it will realign and unify the businesses through establishment of a joint enterprise.

The company has already started construction of the Higashidori nuclear power plant in Aomori Prefecture though the construction is now suspended. To restart the construction, the firm has sounded out other major electric power companies and nuclear power plant makers about a plan of jointly constructing and operating the plant.

By jointly tackling the construction and operation, the company is aiming to share sharply rising construction costs and make it easier to secure profits. However, there are major risks, such as compensation payments in the event of a nuclear

accident. Therefore, caution toward joint operations is running strong in Hitachi and Toshiba, which have not previously operated nuclear plants.

To eliminate anxieties over such risks among the nuclear power plant makers, changes in systems will be required, including to exempt them from compensation payments at the time of a nuclear accident. Some of the related people envisage that joint operation by the four firms will lead to the realignment of the entire nuclear power generation businesses and further to concentration of related human resources and technologies and to construction and export of new nuclear reactors. However, harsh public opinion and circumstances are weighing against nuclear power generation. Therefore, some other people feel that realignment will be difficult unless the government expands support or systems are changed.

**On August 14, the Cabinet of Ministers of Ukraine approved the draft agreement on the financing of an annual action plan on nuclear safety cooperation between the Government of Ukraine and the European Commission Pursuant to the agreement, the European Union will fund the project 'Safe management of spent nuclear fuel and radioactive waste, Component A with a budget of EUR 5.7 million.**

Source: <http://www.asahi.com>, 09 August 2019.

## **NUCLEAR COOPERATION**

### **EU-UKRAINE**

#### **Cabinet Approves Draft Agreement on Financing of Nuclear Safety Cooperation**

The Cabinet of Ministers of Ukraine has approved the draft agreement on the financing of an annual action plan on nuclear safety cooperation between the Government of Ukraine and the European Commission. "On August 14, the Cabinet of Ministers of Ukraine approved the draft agreement on the financing of an annual action plan on nuclear safety cooperation between the Government of Ukraine and the European Commission," the press service of the Ministry of Economic Development and Trade of Ukraine reports. Pursuant to the agreement, the European Union will fund the project 'Safe management of spent nuclear fuel and radioactive waste,



Component A with a budget of EUR 5.7 million.

Source: <https://menafn.com/>, 15 August 2019.

## **UKRAINE-USA**

### **Ukraine-USA Nuclear Science, Engineering Cooperation Project Launches in Washington**

A Ukraine-US nuclear science and engineering project was recently launched in Washington, according to a Facebook post by the Ukrainian Embassy in the United States. The embassy's message said the US federal agencies emphasized "the importance of the development of the Ukrainian-American relations in the nuclear field, in particular in the exchange of knowledge and technologies for safe and the effective use of peaceful nuclear energy."

During the opening event, the Ukrainian diplomats presented the exhibition "50 Inventions Ukraine Gave to the World" at George Washington University, one of America's leading educational institutions. Valeriy Chaly, the Ukrainian ambassador to the United States, noted that Ukraine has great potential and talent in the nuclear field ready to apply their skills to implement joint projects with their American partners.

Source: <http://www.xinhuanet.com>, 09 August 2019.

## **NUCLEAR DISARMAMENT**

### **GENERAL**

### **On Anniversary of Hiroshima, Campaigners Warn of New Nuclear Arms Race as Trump Abandons INF Treaty**

Campaigners in Scotland have marked the 74th anniversary of the Hiroshima bombing by reiterating calls for international nuclear disarmament, following US President Donald Trump's abandonment of the 1987 INF Treaty. Originally signed by then-US President Ronald Reagan and Soviet premier Mikhail Gorbachev, the treaty banned either party from possessing both

nuclear and non-nuclear missiles with ranges between 310 and 3,400 miles other than those launched from sea. The agreement was widely credited with helping de-escalate Cold War tensions prior to the collapse of the Soviet Union.

On 2 August, US Secretary of State Mike Pompeo confirmed that the United States had withdrawn from the deal, claiming that Russia was "solely responsible for the treaty's demise" due to alleged violations of the treaty. The Russian Government has denied any such violation, claiming instead US missile defence systems in Russia do break the deal. Following Pompeo's statement, Russia's foreign ministry confirmed to the Russian state-owned news agency Ria Novosti that the agreement was "formally dead."

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On 5 August, Russian President Vladimir Putin warned that Russia would begin developing short and intermediate-range land-based nuclear missiles if the US started doing the same, saying: "If Russia obtains reliable information that the United States has finished developing these systems

and started to produce them, Russia will have no option other than to engage in a full-scale effort to develop similar missiles."

Following the collapse of the INF treaty, the ICAN warned in a public statement: "By walking away from the INF Treaty, Donald Trump and Vladimir Putin have further undermined the NPT and put the world at heightened risk of nuclear weapons use and war." ICAN - which received the 2017 Nobel Peace Prize for its contribution to the Treaty on the Prohibition of Nuclear Weapons (TPNW), now adopted by 122 UN member-states – called on the US and Russia to undertake urgent talks to restore compliance and re-implement the INF treaty, and "pave the way for nuclear-free security" by the TPNW. Following ICAN's statement, Scottish Green external affairs spokesperson Ross Greer MSP today marked the 74th anniversary of the bombing of Hiroshima by calling on the UK Government to distance itself from the increasingly belligerent Trump administration.

Greer said: "Donald Trump's casual withdrawal from a successful, decades-long arms treaty shows how damaging his presidency is for world peace, and Vladimir Putin's response shows how quickly we could descend into another nuclear arms race. "Today marks 74 years since the US dropped an atomic bomb on the Japanese city of Hiroshima. To prevent an atrocity like this from ever happening again we need to reduce existing nuclear stockpiles, not begin another rush to build more. "But rather than distance themselves from the Trump administration, the UK Government continues to cosy up to it in the hope of winning a trade deal, one which will weaken everything from food standards to environmental protections, and all so they can make up a fraction of the damage Brexit will do to our economy.

"Instead of renewing a nuclear arsenal capable of ending the world dozens of times over, the UK Government should end its superpower delusion and start spending the £200 billion allocated to Trident's replacement on the one in four children in this country living in poverty as a result of Westminster's cruel policies." Also commenting, Scottish Campaign for Nuclear Disarmament (SCND) vice chair Janet Fenton told Common Space: "SCND is a partner organisation in the ICAN and deplores the irresponsible destruction of the 1987 INF Treaty by the current leaders of the United States and Russia.

"At the height of the Cold War, this important bilateral Treaty banned and eliminated intermediate-range missiles, thereby pulling the world back from the brink of nuclear war. By walking away from the INF Treaty, Donald Trump

and Vladimir Putin further undermined the NPT and put the world at heightened risk of nuclear weapons. ...

Source: <https://www.commonspace.scot>. 06 August 2019.

## **NUCLEAR PROLIFERATION**

### **CHINA**

#### **US Blacklists China Nuclear Firms Accused of Aiding Military**

The U.S. added four Chinese nuclear entities to a trade blacklist, accusing them of helping to acquire advanced U.S. technology for military use in China. China General Nuclear Power Group and its subsidiaries China General Nuclear Power Corp., or CGNPC, China Nuclear Power Technology Research Institute Co., and Suzhou Nuclear Power Research Institute Co. were added to the so-called Entity List, according to a Federal Register notice published.

The move comes after a crackdown on U.S. exports of civilian nuclear components and materials in recent years. In 2016 the Department of Justice accused China General Nuclear Power, the country's largest nuclear group, of an espionage plot dating back to the 1990s to steal US technology. The Pentagon has also warned over China's plans to introduce floating nuclear power plants on disputed islands and reefs in the South China Sea.

In October last year the Trump administration also announced that it was imposing further restrictions on exports of nuclear-related U.S. technology to China to "prevent China's illegal

**Donald Trump's casual withdrawal from a successful, decades-long arms treaty shows how damaging his presidency is for world peace, and Vladimir Putin's response shows how quickly we could descend into another nuclear arms race.**

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diversion of U.S. civil nuclear technology for military or other unauthorized purposes." The move follows a similar block against telecommunications giant Huawei Technologies Co., as well as five Chinese tech companies involved in the country's super-computing efforts, that have aggravated the year-long trade war between China and the U.S. The sides are set to resume face-to-face talks in early September.

The notice added 17 entities to a trade blacklist, including groups located in Armenia, Belgium, Canada, Georgia, Hong Kong, Malaysia, Netherlands, Russia, the United Arab Emirates and the U.K. All of them are being put on the list for "acting contrary to the national security or foreign policy interests of the United States," it said. The blacklisting designation bars American companies from doing business with the entities unless they are given special U.S. government approval.

**'Diversion to Military:** The Chinese nuclear firms "engaged in or enabled efforts to acquire advanced U.S. nuclear technology and material for diversion to military uses in China," according to the notice. A call to China's embassy in Washington outside regular business hours, as well as a fax to the foreign ministry in Beijing, went unanswered. An official for CGNPC in Beijing said that the company is aware of the news and the impact on its development would be "controllable."

**Nuclear Espionage:** The Justice Department won a guilty plea in 2017 from an engineer charged with illegally helping China General Nuclear Power procure technology in the U.S., including for the design of so-called Small Modular Reactors, which can have military applications. In 2014, the U.S. accused five Chinese military officials with stealing trade secrets, including nuclear reactor technology from Westinghouse Electric Co.

China General Nuclear is also a key partner in the

U.K., working with France's Electricite de France SA to build the nearly 20 billion pound (\$24 billion) Hinkley Point C project. In 2016, Prime Minister Theresa May delayed a final decision on the development amid speculation that it would give Beijing access to the nation's power system.

Source: Ramsey Al-Rikabi and Shawn Donnan, <https://www.bloomberg.com>, 15 August 2019.

## NUCLEAR NON-PROLIFERATION

### USA

#### New Supercomputer will Help Prevent Nuclear Weapon Testing

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The Department of Energy's newest supercomputer will be capable of conducting 1.5 quintillion calculations per second, making it more powerful than the world's current second most powerful supercomputer. The department announced Aug. 13 that it had inked a \$600 million deal with Cray

Inc. to build its third exascale-class supercomputer. Among other responsibilities, the Energy Department is charged with maintaining the United States' stockpile of nuclear weapons.

Dubbed "El Capitan," the supercomputer is part of the Exascale Computing Project, a DOE effort to increase computing power so that the department can run highly advanced simulations and modelling of the United States' nuclear arsenal. These simulations help alleviate the need for underground testing. El Capitan is expected to be used by the department's National Nuclear Security Administration's weapons design laboratories to run 3D simulations that are too difficult for today's state-of-the-art supercomputers.

"NNSA is modernizing the Nuclear Security Enterprise to face 21st century threats," said Lisa Gordon-Hagerty, the NNSA administrator and the department's under secretary for nuclear security,

said in a release. "El Capitan will allow us to be more responsive, innovative, and forward-thinking when it comes to maintaining a nuclear deterrent that is second to none in a rapidly-evolving threat environment."

El Capitan will be located at Lawrence Livermore National Laboratory in California. The department's two other supercomputers, Aurora and Frontier, are located at Argonne National Laboratory and Oak Ridge National Laboratory, respectively. All three supercomputers are being built by Cray. El Capitan is expected to be delivered in 2022.

Source: Nathan Strout, <https://www.c4isrnet.com>, 15 August 2019.

## **NUCLEAR SAFETY**

### **JAPAN**

#### **60% of Spent Nuclear Fuel in Japan to be Stored in Metal casks in the Future**

Over 60 percent of the some 15,200 tons of spent nuclear fuel in Japan could be stored in metal casks in the future, as the cooling pools that currently hold them are filling up, Kyodo News research showed.

The survey of utility companies' plans revealed the potential volume at a time when each firm is looking at dry casks to boost storage capacity for the ever-increasing, highly radioactive byproduct of nuclear power generation.

They believe the leak-tight canisters will be safer than storing the spent fuel in pools. But keeping them in dry cask storage facilities, which do not need water or electricity to keep spent nuclear fuel cooled, will only be a temporary solution. Analysts say it remains uncertain whether the waste will be taken out for reprocessing and recycling as planned amid technical difficulties and lingering safety concerns following the 2011 Fukushima nuclear crisis.

Residents near the spent nuclear fuel storage sites are worried that the use of dry casks would lead to prolonged storage of the radioactive material. Currently, the fuel storage capacity of 10 utilities that own commercial nuclear reactors totals 25,500 tons, with 60 percent already filled up. If unspent fuel is included, 69 percent will be occupied. The 10 utilities' plans for future storage of spent fuel using dry casks showed that their combined capacity could increase by up to 10,000 tons in the future.

Among them, Tokyo Electric Power Company Holdings Inc., whose Fukushima No. 2 complex holds 1,650 tons of spent nuclear fuel, has decided to build a new storage facility within its premises, while Kansai Electric Power Co., which owns 11 reactors in Fukui Prefecture, plans to find a site to store some 2,000 tons by around 2030. The Nuclear Regulation Authority has also encouraged

utilities to shift storage of nuclear waste from cooling pools to dry casks due to safety considerations.

In the 2011 Fukushima nuclear disaster, which was triggered by a powerful earthquake and tsunami, reactors temporarily lost cooling functions in their spent fuel pools, putting a massive amount of fuel at

risk of overheating and exposure. Meanwhile, a dry cask storage facility, located within the premises of the Fukushima No. 1 plant remained safe, including the containers and the nuclear fuel inside, even though it was flooded by the tsunami.

Source: <https://www.japantimes.co.jp>, 15 August 2019.

### **RUSSIA**

#### **Russia Says Small Nuclear Reactor Blew Up in Deadly Accident**

The failed missile test that ended in an explosion killing five scientists on Russia's White Sea involved a small nuclear reactor, according to a

**Currently, the fuel storage capacity of 10 utilities that own commercial nuclear reactors totals 25,500 tons, with 60 percent already filled up. If unspent fuel is included, 69 percent will be occupied. The 10 utilities' plans for future storage of spent fuel using dry casks showed that their combined capacity could increase by up to 10,000 tons in the future.**

top official at the institute where they worked. The institute is working on small-scale power sources that use “radioactive materials, including fissile and radioisotope materials” for the Defence Ministry and civilian uses, Vyacheslav Soloviev, scientific director of the institute, said in a video shown by local TV.

The men...were national heroes and the “elite of the Russian Federal Nuclear Center,” institute Director Valentin Kostyukov said in the video, which was also posted on an official website in Sarov, a high-security city devoted to nuclear research less than 400 km (250 miles) east of Moscow. The blast occurred Aug 8 during a test of a missile that used “isotope power sources” on an offshore platform in the Arkhangelsk region, close to the Arctic Circle, Russia’s state nuclear company Rosatom said over the weekend. The Defence Ministry initially reported two were killed in the accident, which it said involved testing of a liquid-fuelled missile engine. The ministry didn’t mention the nuclear element.

**Radiation Spike:** It caused a brief spike in radiation in the nearby port city of Severodvinsk, according to a statement on the local administration’s website that was later removed. The Russian military said radiation levels were normal but disclosed few details about the incident. News of the explosion set off in nearby cities and towns a run on iodine, which is believed to help prevent the thyroid gland from absorbing radiation. Norway said it had stepped up radiation monitoring after the incident but hadn’t detected anything abnormal.

Southerly winds and the large distance between the border and the explosion make it unlikely that Finland will detect any radiation, Pia Vesterbacka, director at Finland’s Radiation and Nuclear Safety Authority, said by phone. The authority hasn’t

checked its air filters since the incident but expects to have results this week, she added. Rosatom declined to comment on the incident and a spokeswoman for the Sarov institute couldn’t immediately be reached. Russian media have speculated that the weapon being tested was the SSC-X-9 Skyfall, known in Russia as the Burevestnik, a nuclear-powered cruise missile that President Vladimir Putin introduced to the world in a brief animated segment during his state-of-the-nation address last year.

The incident comes after a series of massive explosions earlier at a Siberian military depot killed one and injured 13, as well as forcing the evacuation of 16,500 people from their homes. Russia’s navy has suffered numerous high-profile accidents over the years. In July, 14 sailors died in a fire aboard a nuclear-powered submarine in the Barents Sea in an incident on which officials initially refused to comment. A top naval official later said the men gave their lives preventing

a “planetary catastrophe.” Russia’s worst post-Soviet naval disaster also occurred in the Barents Sea, when 118 crew died on the Kursk nuclear submarine that sank in after an explosion in August 2000.

Source: <https://www.bloomberg.com>, 12 August 2019.

### **What a Deadly Nuclear Explosion in Russia Tells Us about the World’s New Arms Race**

News of the nuclear explosion at a military base in the far north of Russia trickled out slowly. First came the bulletins on state media of at least two people killed in a mysterious accident. Then came news of a spike in radiation in the area, and footage reportedly showing doctors in hazmat suits treating the victims. Finally, on Aug. 13 – five days after the blast – the Kremlin appeared

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to come clean, confirming that five nuclear scientists and at least two others had died while testing one of the newest weapons in President Vladimir Putin's arsenal. "Accidents, unfortunately, happen," Putin's spokesman told reporters on a conference call that morning.

Indeed, for nuclear experts and negotiators, there was a sense that this particular accident had been waiting to happen. Putin had promised the world a new type of nuclear missile during his state of the nation address last year, a pledge he illustrated with an animation of a rocket landing with a bang in Florida. But the types of weapons he was bragging about—from nuclear-armed cruise missiles to underwater drones packed with radioactive materials—are notoriously difficult and dangerous to build.

"The systems that Putin has been talking about publicly are rather exotic and not as far along, or anywhere close to being ready for deployment," says Lynn Rusten, a nuclear expert who oversaw arms control issues at the National Security Council under the Obama Administration. "That is why the US hasn't pursued them."

At least not yet. But one lesson from last week's explosion may be that any country, be it Russia, the US or China, can pursue such weapons without violating any rules. That's because, over the past few years, the system of treaties that supports the world's security architecture has been unraveling along with the diplomatic ties between Russia and the West.

On August 2, after accusing Russia of deploying banned weapons for years, the US formally withdrew from the INF treaty, which was signed in 1987 to contain both countries' arsenals. An even more ambitious nuclear disarmament deal between the US and Russia, known as New START, is due to expire in 2021, and there isn't much hope

of it being renewed. Putin said in June that he would be willing to extend the treaty for another five years. But John Bolton, the National Security Adviser to President Trump, has said the US is "unlikely" to go along.

The result is a world with less constraints on nuclear weapons, and more countries with the ability to build them. "There's a qualitative arms race going on," says Gary Samore, who helped negotiate New START. "There's a whole new class of strategic weapons that the US, Russia and China are working on that are not subject to any arms control treaties," Samore tells TIME.

**The blast was powerful enough to throw several staff members from Rosatom, the Russian state nuclear agency, off the testing platform and into the White Sea. Though no jump in radiation levels has yet been detected outside Russia, officials across northern Europe have expressed concern that the damaged weapon could contaminate the sea and pose a danger to their citizens.**

The explosion on Aug. 8 highlights the danger of that new reality. State news agency Itar-Tass reported that the blast was powerful enough to throw several staff members from Rosatom, the Russian state nuclear agency, off the testing platform and into the White Sea. Though no jump in radiation levels has yet been detected outside Russia, officials across

northern Europe have expressed concern that the damaged weapon could contaminate the sea and pose a danger to their citizens. The Russian village closest to the blast site was reportedly ordered to evacuate, but local officials said the next day that no evacuation would take place.

The secrecy around the explosion highlights another unpleasant fact about the nuclear era: Governments hate to admit their mistakes when it comes to handling their most dangerous technology, and the desire to hide those mistakes has often made them even deadlier.

After the explosion at the Chernobyl nuclear power plant in 1986, the Soviet authorities waited days before evacuating the area, exposing many thousands of its citizens to extreme levels of radiation. During the first year of Putin's presidency in 2000, a Russian submarine known

as the Kursk sank in the Barents Sea, and his generals were so obsessed with protecting the vessel's nuclear secrets that they refused foreign help with the rescue effort for several days. By the time Norwegian divers were allowed to reach the submarine, all 118 sailors on board were dead.

Russia's citizens, like the rest of the world, do not yet know the full extent of the damage caused by the explosion near the city of Severodvinsk. Learning that will take time and a level of transparency that the Kremlin has not yet been able to meet. But even the available details are enough to understand that this was not simply a case of rotten luck. Given the rate at which the present arms race is accelerating, and the legal constraints on building these kind of weapons are unraveling, such events seem all but inevitable.

"We're entering a period of intense competition," says Michael Carpenter, who formerly served as the top Russia expert at the Pentagon. "How we manage it is vitally important to our national security." And, when it comes to managing nuclear weapons, to the security of the world.

*Source: Simon Shuster, <https://time.com/5652052/russia-nuclear-explosion-arms-race/>, 14 August 2019.*

## **NIGERIA**

### **IAEA Mission Says Research Reactor Operator in Nigeria Committed to Safety after HEU Conversion**

An IAEA team of experts said the operator of a research reactor in Nigeria has demonstrated a high commitment to enhancing safety following the conversion of the reactor core to use LEU as fuel instead of HEU. The team also made recommendations for further strengthening safety.

The Integrated Safety Assessment for Research Reactors (INSARR) team concluded a five-day mission today to assess the safety of the Nigeria Research Reactor-1 (NIRR-1). Originally commissioned in 2004, the NIRR-1 is a Miniature Neutron Source Reactor operated by the Centre for Energy Research and Training (CERT) at Ahmadu Bello University in the northern city of Zaria. It is used for scientific research, neutron activation analysis, and education and training. In 2018, the reactor core was converted in a project initiated by the Nigeria Atomic Energy Commission (NAEC) and supported by China, Norway, the United Kingdom, the United States and the IAEA.

**Russia's citizens, like the rest of the world, do not yet know the full extent of the damage caused by the explosion near the city of Severodvinsk. Learning that will take time and a level of transparency that the Kremlin has not yet been able to meet. But even the available details are enough to understand that this was not simply a case of rotten luck.**

"The reactor operator has effectively utilized experience gained from similar facilities to successfully convert the core from HEU to LEU fuel," said team leader David F. Sears, Senior Nuclear Safety Officer at the IAEA. "The operator is showing a high commitment to safety. However, there is a need for

further improvements, particularly in areas related to organizational measures, safety documentation and operational safety."

The four-member team was comprised of experts from India, Jamaica and the IAEA. The mission, using IAEA safety standards, focused on organizational and management aspects as well as technical areas including safety analysis, operation and maintenance programmes, radiation protection and emergency preparedness. The team visited the reactor and met with NIRR-1 officials. ...

Nigeria has decided to include nuclear power in its energy mix to meet an increasing demand for electricity and support economic development. The country has been developing its nuclear power infrastructure for several years. The INSARR team made recommendations aimed at further improving safety at NIRR-1, including: Completing

the revision of reactor safety documents and operational safety programmes to reflect the results of the commissioning of the reactor after the core conversion and to ensure continued safety improvements. Finalizing the development and implementation of an ageing management programme in a timely manner, in line with IAEA safety standards. Finalizing an integrated management system to enhance safety and foster a strong safety culture. The reactor operator said that it will request a follow-up INSARR mission by 2021.

Source: <https://www.iaea.org>, 09 August 2019.

**NUCLEAR WASTE MANAGEMENT**

**UK**

**What to Do about Nuclear Waste?**

Proponents of nuclear power point to the fact that it produces fewer emissions than fossil fuels and is more reliable than renewable sources like wind or solar, which are dependent on favourable weather. However, one significant side effect of nuclear power plants is the production of nuclear waste. Contrary to what may be popular belief, nuclear waste is rarely a glowing green liquid, and mostly has low levels of radioactivity, with over 90% of the world's nuclear waste considered to be at a low level.

According to a recent article from the Nuclear Decommissioning Authority (NDA) in the UK, the world currently has 22,000m<sup>3</sup> of high-level waste (LW), 460,000m<sup>3</sup> of intermediate-level waste, 3,479,000m<sup>3</sup> of low-level waste and 2,356,000m<sup>3</sup> of very low-level waste, alongside 370,793 therms (tHM) of spent fuel. With the amount of nuclear waste being produced only increasing each year, what is the best way of dealing with this hazardous, mostly solid, material?

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**Going Underground:** With around 75% of the country's energy produced from nuclear power, France has the second-largest nuclear fleet in the world behind the US. It also leads the way worldwide for dealing with nuclear waste, with the IAEA stating in May 2018 that the country's National Radioactive Waste Agency (ANDRA) had a "comprehensive commitment to safety with a responsible approach to the management of radioactive waste and spent nuclear fuel."

One of the processes includes using recycled nuclear fuel, which the World Nuclear Association states forms 17% of France's electricity. This waste first has to be cooled for several years before in water pools, which in the process creates intermediate and high-level waste. These materials are then turned into an "insoluble, solid waste form" in a process known as vitrification, where it is mixed with glass at a temperature of 1200 degrees centigrade. It is then stored in stainless steel containers and allowed to solidify.

Vitrification is a process that takes decades to complete for waste to become safe enough to properly dispose of. For this purpose, the French government authorised the construction of an underground rock laboratory called the Industrial Centre for Geological Storage. Formed of 25km<sup>2</sup> of tunnels in North-eastern France, the project is estimated to cost at least €25bn and may be the final resting place of France's nuclear waste from 2025. This is the French method of dealing with things, what are we doing across the Channel?

**Nuclear Waste in the UK:** The key hub for the UK's nuclear disposal is at the Sellafield nuclear power plant in Cumbria. It is here where the UK's own vitrification project takes place. Sellafield has been described as one of Europe's "most hazardous facilities" for the sheer amount of nuclear waste that it hosts. Maintained by the NDA with a budget of £2bn a year, Sellafield is the home



of the UK's nuclear waste. As of 2014, at least 10,000 containers of waste are stored at the plant, with 94% being low or very low-level waste and just 0.1% high-level waste. Whilst it is treated and vitrified the same way as France, the UK has been unable to find a suitable underground location for its waste.

In 2013 Cumbria county council, which hosts Sellafield, rejected a proposal to store nuclear waste. In 2018 there was talk that the UK might begin burying nuclear under national parks as part of a £12bn scheme known as the geological disposal facility, but this has so far come to nothing.

***Nuclear Storm Clouds Ahead?*** The problem of disposing of nuclear waste is not going away quietly. In a report from January 2019, environmental group Greenpeace warned that dealing with and storing nuclear waste has

become a "global crisis" and criticised governments around the world for lacking long-term planning on dealing with the substance. Alternatives to burying the waste underground have included launching nuclear waste into space and burying it under the sea have also been proposed, but neither have these have been taken up on a major scale.

The nuclear waste conundrum is a serious issue that requires long-term plans from governments around the

world, but it is a long-term concern rather than short-term. According to ANDRA deputy director Jean-Michel Hoorelbeke stated that nuclear waste being produced in the last few years will not need to be disposed of until 2080. There are options to the nuclear waste problem, but the solutions offered so far are expensive, unpopular or not taken up.

*Source: <https://www.power-technology.com>. 12 August 2019.*

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