



Vol 15, No. 8, 15 FEBRUARY 2021

**OPINION – Manpreet Sethi**

**Global Nuclear Non-Proliferation: Ten Years of Rising Dangers**

**Early 2010s: A Mood of Optimism:** The decade of the 2010s dawned with much nuclear hope and optimism, basking in the glow of President Obama’s Prague speech of April 2009. The NPT RevCon in May 2010 reflected and added to this sentiment as a final document was consensually achieved and an ambitious Action Plan identified 46 steps for the promotion of non-proliferation and disarmament.

The mood of the times was also captured by the renowned nuclear strategist, Thomas Schelling, who wrote in an article in *Daedalus*, “There is no sign that any kind of nuclear arms race is in the offing—not, anyway, among the current nuclear powers.... That should contribute to nuclear quiescence.... Except for some ‘rogue’ threats, there is little that could disturb the quiet nuclear relations among the recognized nuclear nations.”

**There is no sign that any kind of nuclear arms race is in the offing—not, anyway, among the current nuclear powers.... That should contribute to nuclear quiescence.... Except for some ‘rogue’ threats, there is little that could disturb the quiet nuclear relations among the recognized nuclear nations.”Indeed, the nuclear superpowers appeared to have arrived at a stable *modus vivendi* that minimised the possibility of nuclear use.**

Indeed, the nuclear superpowers appeared to have arrived at a stable *modus vivendi* that minimised the possibility of nuclear use. President Obama’s 2010 Nuclear Posture Review (NPR)

**CONTENTS**

- ☞ OPINION
- ☞ NUCLEAR STRATEGY
- ☞ BALLISTIC MISSILE DEFENCE
- ☞ NUCLEAR ENERGY
- ☞ NUCLEAR COOPERATION
- ☞ NUCLEAR PROLIFERATION
- ☞ NUCLEAR SAFETY
- ☞ NUCLEAR WASTE MANAGEMENT

recommended limiting the use of nuclear weapons to “extreme circumstances,” thereby at least notionally moving the ‘use’ spectrum to a narrow range of contingencies. On non-proliferation, too, there was a sense of well-being about the NPT, with it having achieved a universality with only four outliers. The two nuclear taboos—against nuclear use and nuclear proliferation—were perceived to be strong.

In 2010, President Obama also convened the first NSS in Washington, DC. The US was joined by 47 other states to call attention to securing nuclear material as a way of countering the threat of

nuclear terrorism. In 2012 and 2014, when the two next Summits were held, the number of participating states grew to 53, and several joint statements, 'house gifts', and 'gift baskets' were announced. By the time of the last Summit in 2016, however, Russia and the US had fallen out, which not only led to Moscow opting out of the event, but also impacted other aspects of their nuclear relationship.

**Mid-Decade: An Altered Nuclear Landscape:**

The souring of US-Russia relations began with the Ukrainian crisis in 2014 and eventually began reflecting in their nuclear policies as well. For instance, further arms control between US and Russia stalled, and mutual accusations of nuclear build-up in violation of existing treaties, such as the INF Treaty, began to be made. It was around this time that emerging Chinese belligerence also began to alter other inter-state equations. As political relations became stressed among the major nuclear powers, hedging strategies became visible in military capability build-up, including 'nuclear modernisation'.

Meanwhile, fissures between the nuclear weapon (NWS) and non-nuclear weapon states (NNWS) erupted at the 2015 NPT RevCon, which was unable to achieve a consensus final document. NNWS refused to accept more non-proliferation obligations, such as denial of enrichment and reprocessing technologies or acceptance of the Additional Protocol as mandatory for nuclear cooperation. Instead, they urged NWS to move towards disarmament. It may also be recalled that before the RevCon, two Humanitarian Initiative

conferences were held in 2013 and 2014, which drew attention to the catastrophic humanitarian consequences of nuclear use and hence the need for their delegitimization. This initiative gathered momentum with several NNWS pressing for negotiations for a treaty to eliminate nuclear weapons. In response to an UNGA resolution, a

UN conference to negotiate a legally binding instrument was convened in 2017. None of the nuclear-armed states, however, participated in these negotiations. Nevertheless, riding on the support of some enthusiastic NNWS, the effort led to the adoption of the TPNW in June 2017.

While the Ban treaty was being negotiated, much doctrinal churning and capability build-up were underway in the nuclear-armed states. President Trump's entry in 2017 heralded a casualness in US' nuclear approach, which became evident in a display of nuclear brinkmanship. His

'tweeterances' (deterrence through tweets) with North Korea are ample illustration of this phenomenon. The 2018 NPR expanded the role of nuclear weapons to include large-scale conventional, cyber, and space attacks. It identified Russia and China as significant nuclear challenges, deterring

whom required a range of capabilities, including low-yield nuclear weapons for regional contingencies. Efforts were initiated to build submarine-launched, nuclear-armed cruise missiles to add to the already formidable American deterrent.

Meanwhile, Russia was already fortifying its

**The souring of US-Russia relations began with the Ukrainian crisis in 2014 and eventually began reflecting in their nuclear policies as well. For instance, further arms control between US and Russia stalled, and mutual accusations of nuclear build-up in violation of existing treaties, such as the INF Treaty, began to be made. It was around this time that emerging Chinese belligerence also began to alter other inter-state equations.**

**While the Ban treaty was being negotiated, much doctrinal churning and capability build-up were underway in the nuclear-armed states. President Trump's entry in 2017 heralded a casualness in US' nuclear approach, which became evident in a display of nuclear brinkmanship. His 'tweeterances' (deterrence through tweets) with North Korea are ample illustration of this phenomenon.**

nuclear deterrence through building 'invincible' weapons that no defences could defeat. Underwater nuclear-armed drones and hypersonic missiles were among the new weapon systems introduced to meet the challenges posed by the US pursuit of BMD and Prompt Global Strike (PGS). Russia also emphasised its tactical nuclear weapons to give credence to a strategy of 'escalate to de-escalate' in case of US/NATO conventional attacks.

While a distant third in terms of nuclear numbers, China, too, became more open about its nuclear modernisation efforts in this period. 2018-2020 saw Beijing reflecting far greater confidence in its nuclear missiles in terms of their survivability, penetrability, and accuracy.

**A Decade Ends: Risks of Nuclear Use and Proliferation Rise:** As a result of these and other

related developments, the decade ended with a higher sense of the risk of nuclear use, especially as a result of accidental use due to miscalculation or misperception exacerbated by the fog of war. Strained inter-state relations, unregulated modernisation of nuclear arsenals, emergence of new technologies, and breakdown of the arms control architecture were some of the factors aggravating nuclear risks.

The possibility of nuclear proliferation, too, re-emerged. On the one hand, North Korea's nuclear and missile advancements continued to haunt South Korea and Japan. Both countries saw the emergence of debates on developing their own nuclear capability to establish credible deterrence. Meanwhile, in West Asia, the threat of nuclear proliferation accelerated after the 2018 US withdrawal from the JCPOA with Iran. The 2015 agreement had actually marked a high point for

**While a distant third in terms of nuclear numbers, China, too, became more open about its nuclear modernisation efforts in this period. 2018-2020 saw Beijing reflecting far greater confidence in its nuclear missiles in terms of their survivability, penetrability, and accuracy.**

**In West Asia, the threat of nuclear proliferation accelerated after the 2018 US withdrawal from the JCPOA with Iran. The 2015 agreement had actually marked a high point for non-proliferation since it was meant to arrest Iran from enriching uranium beyond 3.67 per cent, and keeping the stockpile below 300 kg.**

non-proliferation since it was meant to arrest Iran from enriching uranium beyond 3.67 per cent, and keeping the stockpile below 300 kg. Several other restrictions were also put in place while allowing Iran to pursue the full fuel cycle for its peaceful nuclear programme, albeit under IAEA safeguards. The stalling of the JCPOA resulted in Iran also taking 'remedial measures' of its own, including enriching uranium up to 20 per cent. By the end of 2020, it had accumulated close to 17 kg of such uranium. While this is far from weapons capability, threat perceptions in Saudi Arabia, Turkey, and the UAE are on the rise.

**Doomsday (Clock) Reflections:** Over the years, the Doomsday Clock maintained by the *Bulletin of the Atomic Scientists* since 1947 has become a good indicator of the state of global nuclear (and climate) concerns. In 2010, the minute hand of this

clock stood at 6 minutes to midnight. In fact, the time was adjusted from previous year's 5 to 6 minutes. President Obama's problem-solving approach to nuclear issues with Russia, Iran, and loose nuclear material were all seen as contributors to a 'hopeful state of affairs'. However, in 2012, the minute hand was once again back at 5 minutes owing to a lack of action on nuclear arms reductions or disarmament.

The rest of the decade saw the world's steady progression closer and closer to midnight. In 2015, the time reduced to three minutes; in 2017, it moved up by another thirty seconds; in 2018, by another thirty seconds; and, in 2019, by twenty more seconds. Consequently, the year 2020 ended with the dubious distinction of the world being at 100 seconds to midnight—the closest ever to Armageddon. Ironically, this happened in the same year that the world commemorated the 75th year

of the atomic bombings, and NPT's 50th year. The TPNW attained its 50th ratification, enabling it to enter into force in January 2021, also in 2020. While this last development is noteworthy at least on a normative scale, it does not lead to a world free of nuclear weapons. Nuclear-armed states remain entrenched in deterrence beliefs and capability build-up despite the unprecedented healthcare emergency that mauled their economies through 2020.

As the world steps into 2021, hope has been pinned on the change in American leadership. Given the power of this one country to steer global nuclear developments, and given that President Biden has indicated a wise and stabilising approach to many nuclear issues, optimism for a change of nuclear direction is widespread. While none believe that a world without nuclear weapons will suddenly and miraculously become possible, perhaps it will be possible to inch towards a safer nuclear perch from where such a world at least becomes visible.

Source: [http://www.ipcs.org/comm\\_select.php?articleNo=5755](http://www.ipcs.org/comm_select.php?articleNo=5755), 09 February 2021.

**OPINION – Peace and International Policy DSC**

**Despite Treaties, Nuclear Weapons Remain**

The lack of nuclear disarmament in 2021 constitutes a global failure to address this continuing existential threat to humanity. As of 22 January 2021, nuclear weapons have become illegal under international law with the TPNW entering into force. The accord is rightly celebrated as a “historic milestone” (UN Secretary-General António Guterres) of nuclear disarmament legislation, and

**Consequently, the year 2020 ended with the dubious distinction of the world being at 100 seconds to midnight—the closest ever to Armageddon. Ironically, this happened in the same year that the world commemorated the 75th year of the atomic bombings, and NPT's 50th year.**

a beacon of hope for anti-nuclear groups around the world. Furthermore, it constitutes an important act of solidarity and mutual collaboration among participating nations. However, its real world effects on the reduction and elimination of nuclear weapons still remain rather dubious.

As Noam Chomsky has warned, the threat of nuclear war should be taken very seriously. Nuclear weapons remain one of the three most pressing potential causes for the extinction of humanity. Chomsky underscores that it is a “virtual miracle that we have survived, not only from numerous accidents but also from occasional very reckless acts of leaders”.

William Perry, a leading authority on nuclear security issues, has a long history inside the walls of national security departments and the corporate boardrooms affiliated with them. He came out of his retirement a couple of years ago to warn the world that: “[t]oday, the danger of some sort of a nuclear catastrophe is greater than it was during the Cold War (...) and most people are blissfully unaware of [it].” The world is facing a double threat with regard to nuclear weapons; the danger that they pose in and of themselves as well as peoples astonishing lack of attention to that danger.

**The lack of nuclear disarmament in 2021 constitutes a global failure to address this continuing existential threat to humanity. As of 22 January 2021, nuclear weapons have become illegal under international law with the TPNW entering into force. The accord is rightly celebrated as a “historic milestone” of nuclear disarmament legislation, and a beacon of hope for anti-nuclear groups around the world.**

*From First Steps at the UN to the Non-Proliferation Treaty:* The first official act of corroboration on the threat of nuclear war occurred on 24 January 1946 in the UNGA, passing its first ever resolution by 46 votes to null. It called for the “Establishment of a commission to deal with the problems raised by the discovery of atomic

energy”. This initial call on the UN Security Council to work on eliminating nuclear weapons failed as

more of the Permanent Members of this group acquired them over the next two decades. However, in the following years constant civil society pressure, the 1958 standoff over Berlin, the Cuban missile crisis of 1962 and further proliferation of nuclear armaments began to create an impetus for the necessity of nuclear arms control treaties.

This momentum led to agreements placing limits on the United States and the Soviet Union regarding their nuclear arsenal, delivery and defensive systems. This began with the ABM, which placed a cap on missile defenses on both countries, amongst other limitations.

Further negotiations in the 1980s established the INF treaty that saw the prohibition of land based ballistic and cruise missiles with a range of 500-5000 kms — while excluding air and sea-based systems. This led to the destruction of nearly 2700 nuclear weapons. Next came the START I that saw a decrease in nuclear armaments of the Soviet Union/Russia and the United States between 1991 and 2009. While successive negotiations on START II and START III failed, the United States and the Russian Federation inked a bilateral treaty in 2010 — New START — that further reduced the deployed nuclear arsenals of each country to 1550.

In the interweaving years however, the ABM and INF treaties ceased to exist due to the withdrawal of the United States in 2002 and 2019 respectively. This means that New START is the only remaining nuclear weapon arms control agreement between Russia and the US — with both countries accounting together for more than 90% of the global total. Recent reports from the Kremlin and the White House indicate that New START will be renewed for a further five years into 2026. Unless both parties agree on an extension, this last limitation will expire in only a few days' time — on 5 February, 2021!

**The ABM and INF treaties ceased to exist due to the withdrawal of the United States in 2002 and 2019 respectively. This means that New START is the only remaining nuclear weapon arms control agreement between Russia and the US — with both countries accounting together for more than 90% of the global total.**

Multilaterally, the NPT was expected to stem the increase of nuclear weapon states. It further placed an obligation on those that possess them to engage in nuclear disarmament under Article 6 of the NPT. The deficiency to pursue this objective by the signatories, coupled with the expansion of nuclear weapon states from five in 1968 to nine as of 2021, indicates a global failure to address this continuing existential threat to humanity. A hazard that, until the coming into force of the TPNW, had not been illegal.

The lack of such prohibition was cited by the International Court of Justice (ICJ) in its 1996 Advisory Opinion on the "Legality of the Threat or Use of Nuclear Weapons". The Court had noted that arms control agreements — until 1996 — did not constitute "comprehensive and universal conventional prohibition on the use, or the threat of use" of nuclear weapons. TPNW — as an instrument of international law — changes the status quo. Should another case related to the legality of nuclear weapons fall before the ICJ, those arguing for its legality will find their case resting on thinner ice.

While the treaty only applies to state parties, it marks an achievement on arms control norms in international affairs: The actors involved in the process have expanded from individuals and civil society to intergovernmental organisations. Thereby — through this evolution in the norm life cycle — handing activists a further authoritative benchmark to point to in their efforts surrounding nuclear weapons.

Next to this, the constitution of the agreement also provides nuclear disarmament movements, as concerned people around the world in general, with a symbol of progress in the matter. Not least, because its establishment largely is a success of activist fringes involved in the issue. This reflects the positive effects that these kinds of efforts can have. It points toward actions that could and

should be undertaken in the future, if this existential threat to humanity is to be overcome.

The treaty also constitutes an important act of cooperation and joint action among nations of the Global South. If one simply considers who are the signatories of the TPNW, this fact immediately becomes evident. Of all 193 UN member states “only” 84 signed the agreement — among them mostly countries from the developing world, which don’t themselves hold or produce nuclear weapons.

Crucially; all nine nuclear weapons states, as well as all NATO member states, neither signed nor even took part in the deliberations leading up to the accord — except the Netherlands, downvoting the adoption of the treaty at the July 2017 conference dedicated to the negotiation of the agreement.

As in many other cases — whether they be economic or social or military etc. in nature — the same pattern persists. The South convenes and cooperates on an issue with work toward progressive ends in mind — most often balancing the scales of power and privilege between North and South — and the North abstains from participation and denies meaningful coverage in the outlets of its doctrinal systems; i.e., the media, academia.

The graphic shows the signers of the TPNW; divided into those who ratified the agreement (green) and those which have yet to do so (yellow). All countries coloured in grey have not signed the treaty.

So, to take one case, which demonstrates this, which also happens to be directly linked to the issue of nuclear weapons; How many people in the West know of the hundreds (if not thousands)

of civilians and veterans killed or severely injured by the effects of the US, France and Britain’s nuclear tests in Oceania? How often has one read in the Western press of the 500 time maximum of acceptable radiation that Tahiti, the most populated island in Polynesia, was exposed to during France’s nuclear tests there in the 1960-

70s? How often did the words “literally been showered with plutonium for two days” as an investigator for the Polynesian government, Bruno Barillot noted, appeared in major European publications? This stands in stark contrast to the long held official position of the French government that

their nuclear tests had always been clean. How many people know that out of 800 dossiers filed against the French government by victims of the test or their families, only 11 have received compensation thus far? Their voices — as the voices of the victims of the Global North in general are — largely go unheard.

Another case, which reflects the same pattern, occurred in February 1999, when two sets of significant economic talks were taking place simultaneously. One were the talks of the G-7 (seven wealthiest nations), which, as usual, received ample coverage in the western media. Another were those of the G-15 — now 18, then 17 countries

from the so-called developing world, including in them economically quite substantial ones, such as Argentina, Brazil, Chile, Mexico, India, Indonesia and Nigeria — countries which can’t just be dismissed from the world stage. The sets of talks between these nations received remarkably less attention in the western world; in some countries, like the United States or Great Britain, close to none.

**The treaty also constitutes an important act of cooperation and joint action among nations of the Global South. If one simply considers who are the signatories of the TPNW, this fact immediately becomes evident. Of all 193 UN member states “only” 84 signed the agreement — among them mostly countries from the developing world, which don’t themselves hold or produce nuclear weapons.**

**How many people know that out of 800 dossiers filed against the French government by victims of the test or their families, only 11 have received compensation thus far? Their voices — as the voices of the victims of the Global North in general are — largely go unheard.**

In them, leaders from the Global South lamented the fact that the United States and Britain were unwilling to enter into dialogue with them on a number of issues. These included possible reforms to WTO rules, which might, for a change, not only benefit Northern countries, but also those of the South beyond the level which they are usually accustomed to; that of left-overs from the rich's table.

The North's main exponent and its faithful "lieutenant" (as a senior Kennedy adviser once characterised the US-British relationship) however remained silent on the occasion — as on so many others. And neither this, nor the plea to consider some moderate controls on foreign, mainly Western, investment were heard by political actors in the West or echoed by their counterparts in the media.

In opposition to this kind of irreverence, DiEM25, which has consistently denounced armed conflict and called for peaceful resolution of disputes, calls for — as a first step — the removal of all nuclear weapons from the European territory. We further denounce the encroachment of the arms industry into primary and secondary education — an important aspect which is often not considered. But schools should not be part of the normalisation of the next generation to war. We also remain concerned over the allowances provided to nations for their military emissions under the Paris Agreement — noting that the US military alone emits more than 140 countries combined.

Source: <https://diem25.org/despite-treaties-nuclear-weapons-remain/>, 02 February 2021.

**OPINION – Zhanna Malekos Smith**

**America's New Strategy for Space Nuclear Power**

Among the flurry of executive orders and proclamations signed during his final weeks in

office, President Trump issued two directives that have received little fanfare—about space. One directive concerns enhancing the cybersecurity of GPS satellites. The other is perhaps more exciting: It focuses on exploring Mars and the moon.

Since the late 1960s, the US has leveraged nuclear energy technology to help power spacecraft. Recent examples include the ongoing New Horizons mission, the Cassini mission to Saturn and the Voyager 1 mission to reach interstellar space for the first time in history. These missions used radioisotope power systems—nuclear energy technology that converts heat into energy by harnessing the natural radioactive decay of plutonium-238.

On 16 Dec 2020, Trump established a national strategy for enhancing space nuclear power. Space Policy Directive-6 prioritizes developing more advanced radioisotope power systems capabilities and nuclear propulsion systems to support robotic and human exploration of Mars and the moon. Stretching across the solar system from Mercury to Neptune, the US was the first state to reach every planet with a space probe

and complete a reconnaissance study of the dwarf planet Pluto. Now, the US is poised to become the first state to launch a space nuclear propulsion system under Space Policy Directive-6. According to the Trump White House's directive, although "no space nuclear propulsion systems have been launched to-date," these systems are necessary for space exploration because they will shorten travel time to Mars. But while the directive's goal of space exploration is admirable, it gives too little attention to crucial safety considerations.

Space nuclear propulsion systems can help shorten travel times, which helps protect crewed and robotic spacecraft from prolonged exposure to harsh radiation in space. In turn, developing advanced radioisotope power system capabilities will also provide spacecraft with a greater source of energy for deep-space missions, and as NASA

**Leaders from the Global South lamented the fact that the United States and Britain were unwilling to enter into dialogue with them on a number of issues. These included possible reforms to WTO rules, which might, for a change, not only benefit Northern countries, but also those of the South beyond the level which they are usually accustomed to; that of left-overs from the rich's table.**

explains, “better fuel efficiency versus solar energy in darker and colder locations.” Overall, NASA supports the directive and reasons that radioisotope power systems “offer the key advantage of operating continuously over long-duration space missions, largely independent of changes in sunlight, temperature, charged particle radiation, or surface conditions[.]” This is desirable because it enables human exploration of Mars and the moon, as well as “extending robotic exploration of the solar system.”

The directive has three main goals. First, it calls for developing new uranium fuel-processing capabilities by the mid-2020s to “enable production of fuel that is suitable for lunar and planetary surface and in-space power,” including nuclear electric propulsion and nuclear thermal propulsion functions. On that point, the directive reinforces the centrality of the 2019 National Security Presidential Memorandum-20, which discusses the process for launching spacecraft containing space nuclear systems, as well as Executive Order 13803 to revive the National Space Council.

Second, the directive promotes cooperation with commercial space partners to enhance cost savings and foster additional research opportunities in space exploration. And third, it emphasizes developing and using advanced nuclear power capabilities like radioisotope power systems and fission reactors for space exploration. By 2027, NASA expects to “initiate a fission surface power project for lunar surface demonstration...with scalability to Mars exploration.”

Under this new policy, the US could become the first state to launch a space nuclear propulsion system. As written, however, Space Policy Directive-6 provides greater guidance on leveraging advanced nuclear power systems to explore Mars than it does on promulgating security principles for criticality accident planning

and launch safety.

Criticality assessment—that is, evaluating each system function for potential points of failure and evaluating how to minimize loss of life or damage to the system in the event of an accident—is essential for many reasons. For example, it could help quickly determine a course of action if a nuclear-powered satellite were to malfunction and accidentally re-enter the Earth’s atmosphere, contaminating Earth surfaces with radiation. But despite these concerns about accidental re-entry from Earth orbit or during an Earth flyby, the directive is surprisingly silent on criticality assessment standards; instead, it briefly mentions that a “highly reliable operational system” is needed for spacecraft operating fission reactors in low-Earth orbits. Likewise, although the directive states that any sponsoring agency of space nuclear power

and propulsion programs will hold the “primary responsibility for safety,” it fails to define the baseline safety standards for the operation and disposition of these advanced systems.

To be clear, developing space nuclear propulsion systems is both an admirable goal and an

opportunity to signal the US’ strategic resolve and intentions in space. The art of signalling in international relations, as explained by Ben Buchanan in *The Hacker in the State*, “is to hint credibly at the cards one holds, in an attempt to influence how the other side will play its hand.” For developing space doctrine, failing to articulate U.S. “principles of safety, security, and sustainability” with granularity is a missed opportunity in international relations to shape the behaviour of other spacefaring nations, as well as aspiring spacefaring nations. Both groups look to the United States as a model to follow—so if the U.S. cuts any safety corners for the operation and disposition of these advanced systems, other states may view that approach as something to emulate. As noted in the Department of Defense’s 2020 *Defense Space Strategy*, communicating with allies and other partners is necessary for ensuring space stability.

**First, it calls for developing new uranium fuel-processing capabilities by the mid-2020s to “enable production of fuel that is suitable for lunar and planetary surface and in-space power,” including nuclear electric propulsion and nuclear thermal propulsion functions.**



It remains to be seen whether the Biden administration will embrace the directive's goal for the US to become the first state to launch a space nuclear propulsion system.

Although the Biden administration "has yet to indicate what it plans to do with President Trump's legacy in this area" of space initiatives, reports the *New York Times*, on February 3, White House spokeswoman Jen Psaki stated that President Biden "fully supports" the U.S. Space Force and that the administration looks forward to continuing the work of Space Force. At the time of this writing, the Biden administration has not addressed the issue of space nuclear power. According to *Breaking Defense*, space policy "isn't expected to have a high profile in the administration of incoming President Joe Biden, given the pandemic, the flailing economy, the climate crisis and a number of foreign policy challenges[.]" ...

Despite the uncertainty about the Biden administration's posture on space exploration, as a recommended first step the administration should encourage collaboration between the U.S. government and the commercial space sector to advance the nation's strategic capabilities and signal what it means to be a good steward of space. To advance America's strategic leadership in space, the new administration should ensure that these laudable space goals are pursued in equal measure with safely harnessing advanced nuclear power systems.

Source: <https://www.lawfareblog.com/americas-new-strategy-space-nuclear-power>, 03 February 2021.

OPINION – Carl Robichaud, Karim Kamel

### The Real Value of the Nuclear Ban Treaty

**As a recommended first step the administration should encourage collaboration between the U.S. government and the commercial space sector to advance the nation's strategic capabilities and signal what it means to be a good steward of space. To advance America's strategic leadership in space, the new administration should ensure that these laudable space goals are pursued in equal measure with safely harnessing advanced nuclear power systems.**

In January, 2021, 75 years after nuclear weapons were first used, a treaty came into force that bans them. The TPNW, also known as the ban treaty, is the culmination of a decade of work by civil society leaders and diplomats who, frustrated by stagnation in traditional venues, focused the lens of international humanitarian law on nuclear weapons.

This approach, dismissed at first, resonated with many states that understood nuclear weapons to be inherently indiscriminatory and inhumane.

The new treaty outlaws the use or threat of use of nuclear weapons, prohibits their development and possession, bans their transfer or receipt, and prohibits stationing, deploying, or assisting with nuclear arms. But does any of this matter? The treaty lacks verification and enforcement mechanisms. No state with nuclear weapons will join anytime soon. The nine nuclear-armed states and their allies boycotted the negotiations and pressured other states to abandon the treaty. Each has nuclear modernization programs that will stretch for decades.

**Skeptics of the treaty claim it is worse than irrelevant; it will accentuate tensions, undermine collective action on urgent proliferation challenges, diminish alliance cohesion or strategic stability, and potentially establish an alternative to the NPT. We should not, they argue, take any steps that might undermine this bedrock agreement that for 50 years has helped limit the spread of nuclear arms.**

Skeptics of the treaty claim it is worse than irrelevant; it will accentuate tensions, undermine collective action on urgent proliferation challenges, diminish alliance cohesion or strategic stability, and potentially

establish an alternative to the NPT. We should not, they argue, take any steps that might undermine this bedrock agreement that for 50 years has helped limit the spread of nuclear arms.

These objections are overstated. Collective action against proliferation has been, and will remain, a challenge with or without the ban treaty.

Moreover, the treaty was carefully drafted not to conflict with existing non-proliferation obligations, including the NPT.

But the broader point holds:

The treaty does little to reduce short-term nuclear risks. That is not its point. What the treaty does is establish, in clear and certain terms, that nuclear weapons are unacceptable. Over 122 countries supported the adoption of the treaty, 51 states have ratified it, and these numbers will

continue to grow. Even within states that oppose the treaty, many citizens agree with its premise. Various polls suggest more than half of Americans believe the US should work to eliminate all nuclear weapons, and support for this view is even higher in Japan and among NATO countries. In the words of former US Defense Secretary William Perry, the ban treaty "rightly establishes abolition as the standard that all nations should be actively working to achieve, rather than an indeterminate future goal."

The status quo, with its 16,000 nuclear weapons, is far from stable.

Everyone alive today lives in the shadow of a potential nuclear war. Climate modelling suggests that even a limited nuclear war, such as one between India and Pakistan, could result in a billion deaths as the ash from burning cities "could blot out the sun, starving much of the

human race."

The treaty represents a refusal to live forever under this nuclear shadow. It reflects a belief that the status quo represents a grave inequity, in which nuclear costs are imposed upon all, while the benefits of nuclear arms accrue to the few states privileged to possess them. In a world of inequities, this is especially pernicious because it is hidden from view. In its preamble, the ban treaty calls out the disproportionate effects on marginalized communities, including indigenous peoples, societies harmed by testing, and women.

At least from a humanitarian point of view, the question has been settled: Nuclear weapons are unacceptable. That alone will not make them disappear. But, in the

meantime, the ban treaty need not distract from bilateral arms-control and threat-reduction efforts. The recent agreement to extend New START should be commended, and we must establish new mechanisms to build confidence and reduce tensions. The existence of a treaty banning nuclear weapons does not contradict these efforts; on the contrary, it should help build support for more sensible nuclear postures and for prohibitions on nuclear explosive testing and the production of weapons-usable materials.

The nuclear age is in its eighth decade, a mere dot on the timeline of human history. In this brief span there have been dozens of known close calls and near misses. So long as these weapons exist, ready to use at a moment's notice, we court disaster. The nuclear powers find themselves, as Khrushchev wrote to Kennedy during the Cuban missile crisis,

**The treaty does little to reduce short-term nuclear risks. That is not its point. What the treaty does is establish, in clear and certain terms, that nuclear weapons are unacceptable. Over 122 countries supported the adoption of the treaty, 51 states have ratified it, and these numbers will continue to grow.**

**The nuclear powers find themselves, as Khrushchev wrote to Kennedy during the Cuban missile crisis, in a tightening knot. Untying this knot will require a multi-generation project that brings together verification science with extraordinary foresight, diplomatic skill, and political leadership.**

in a tightening knot. Untying this knot will require a multi-generation project that brings together verification science with extraordinary foresight, diplomatic skill, and political leadership. But first it requires a change in our collective beliefs about nuclear weapons. This is the contribution of the ban treaty, and it should not be underestimated.

Source: <https://thebulletin.org/2021/02/the-real-value-of-the-nuclear-ban-treaty/>, 04 February 2021.

**OPINION – Manpreet Sethi**

**Nuclear Numbers: Assessing China's Threshold of 'Unacceptable Damage'**

Nuclear deterrence works on the principle of causing unacceptable damage in response to nuclear use. But what kind of damage do nations find unacceptable? How does one calculate what would be unacceptable to another? Answers to these questions are difficult, but important because a fair assessment of what the adversary would find unacceptable can help to right-size one's own nuclear arsenal. Different countries, like different individuals, have disparate thresholds of damage absorption. For instance, during the Cold War, the US concluded that the USSR would be deterred if 50% of Soviet industry and 25% of its population were to be destroyed.

Meanwhile, President Kennedy's hesitation to lose even one American city during the Cuban missile crisis revealed America's low damage threshold. Interestingly, in the case of Communist China, Premier Mao had created the image that his country had a high damage-taking capacity. Dismissing nuclear weapons as a "paper tiger", he suggested that American nuclear use could not deter China because even if 50 million Chinese died, an equal number would survive to carry the country forward. But is this assumption true even today? How does modern China perceive damage? The answer to this question should be of particular

interest to India. Of course, the declared nuclear doctrines of no first use by India and China minimise the possibility of a deliberate nuclear war. But since India is compelled to retain a nuclear capability for deterrence, it also becomes necessary to premise the force structure on certain intelligent parameters. An assessment of the damage tolerance threshold of China is one of them.

Such an exercise requires a methodical and continuous study of China's strategic culture so that one may avoid the pitfalls of mirror-imaging. Amongst the many factors that can help assess damage tolerance thresholds, five are particularly relevant. The first is to understand the historical

**Since India is compelled to retain a nuclear capability for deterrence, it also becomes necessary to premise the force structure on certain intelligent parameters. An assessment of the damage tolerance threshold of China is one of them.**

experiences since a country that has been through more wars and experienced losses is expected to have a higher damage tolerance threshold. China has experienced severe upheavals such as the

Great Leap Forward and Cultural Revolution. 45 million people are estimated to have died in these two events and several more suffered immense deprivation and misery.

This, however, happened, in the 1960s-1970s. China's participation in the Vietnam war too had ended in 1975. Modern China built since then, has little experience of sufferings caused by inter-state wars. Secondly, damage acceptability depends on the nature of the political system, with the assumption being that a closed, authoritarian system would be able to take more damage than a democracy. While China is authoritarian, the Chinese Communist Party is extremely careful to sustain an image of legitimacy based on popular support. This, however, is not as easy to maintain today as it once was owing to society having become better educated, expressive and digitally connected.

Therefore, the Party decision-making cannot afford to be insulated and ignore the mood of the masses. The third factor is the level of economic

development, since an economically well-off and materially aspirational society is believed to have a low stomach for damage. Given China's pride in its economic achievements and with the large middle class having tasted a certain quality of life, it can be expected to be risk-averse and have a low damage tolerance level. Fourthly, the damage threshold varies depending on the value a country places on the objective it seeks. The more a country is politically, economically and emotionally invested in the objective, the greater its willingness to bear damage. For instance, in case of a conflict over Taiwan, which China considers an existential threat, its threshold of damage is likely to be higher than in case of conflict in high Himalayas or over areas disputed with India.

Lastly, the nature of the leadership can push the threshold up or down, such that highly nationalist leaders, willing to take risks, have a higher damage absorption capacity. President Xi Jinping does appear to be more risk-loving than others. But, as the leader of a 90-million strong Party, even he cannot be averse to opinions of others. In fact, given the "China dream" that he has sold to his citizens, he has a larger "face" to defend too. And, any act that results in damage to his people can be perceived as his inability to control the situation and dent his image. Contemporary China, therefore, appears to have a far lower threshold for taking damage than it once projected.

This is further illustrated by the manner in which it sought to hide figures of the dead, both from the pandemic, as well as from the clash with Indian soldiers in Galwan valley. While non-transparency, and a tendency to play down losses, has always been a Chinese trait, this propensity is exacerbated by factors, such as its current demographic reality. The harsh imposition of one child policy has led to a situation where a young male bears responsibility for a number of aged family members. His untimely death, then,

adversely impacts the wider society and popular sentiment. This is an even greater problem since the society is today better networked over digital platforms.

These, and more such insights, should help India to calculate the "right" size of its nuclear arsenal in order to signal credible deterrence. India has articulated the idea of credible minimum deterrence, which eschews excessive stockpile accumulation in favour of building just enough to cause unacceptable damage. And, as is apparent, contemporary China's ability to absorb damage does not need much.

*Source: <https://www.sundayguardianlive.com/opinion/nuclear-numbers-assessing-chinas-threshold-unacceptable-damage>, 06 February 2021.*

### OPINION – Ryan R. Swan, Haig Hovaness

#### The Arms Race in Emerging Technologies: A Critical Perspective

Growing arms racing in emerging technologies does not advance its desired goals of achieving strategic advantage and enhancing deterrence. In fact, it is strategically suspect, gratuitously risky and economically wasteful. Europe can – and should – play a leading role in encouraging restraint and advancing needed arms control in the high-tech sphere.

**Background:** Since the dawn of civilization there

has been competition among nations in pursuit of superior weaponry. The race for ever greater weapon destructive power culminated in the development of nuclear weapons. This quest, motivated by age-old logic that superior force translates into battlefield success, encountered a dead end when mutually assured destruction took hold during the Cold War. Strategists quickly recognised a credibility problem with threatening the use of mutually-devastating force in response to minor provocations.

**The nature of the leadership can push the threshold up or down, such that highly nationalist leaders, willing to take risks, have a higher damage absorption capacity. President Xi Jinping does appear to be more risk-loving than others.**

The preferred workaround, exemplified by the Kennedy Administration's flexible response policy, was to retain the pursuit of superior force, albeit in modified form. Instead of concentrating on nuclear superiority in now infeasible total war, the nuclear powers shifted focus to achieving the conventional upper hand in lower-level, more 'fightable' conflict settings.

Considerable capital was invested in a conventional military build-up with corresponding strategies for careful escalation management.

This led to the cultivation of impressive non-nuclear warfighting capabilities, including advanced precision-guided munitions, which the US demonstrated with intimidating success in the First Gulf War. However, post-Soviet Russia and ascendant China began to catch up with sophisticated conventional capabilities of their own

enabling them to carry out devastating attacks on US military bases and logistics networks. Additionally, they developed new strategies to challenge the US in the so-called 'grey zone' below the level of overt conventional warfare.

To summarize the current strategic state of affairs: nuclear war remains an unwinnable dead end, despite reinvigorated major power nuclear competition. Meanwhile, the continual advancement of conventional capabilities has dramatically increased the speed of potential armed conflict and the likelihood of sustaining serious losses and damage to critical assets earlier in conflict scenarios, frustrating escalation management. As such, conventional war between major powers is now too becoming growingly infeasible and strategists are being forced to confront a quandary similar to the one they faced six decades ago when nuclear war became unfightable.

**To summarize the current strategic state of affairs: nuclear war remains an unwinnable dead end, despite reinvigorated major power nuclear competition. Meanwhile, the continual advancement of conventional capabilities has dramatically increased the speed of potential armed conflict and the likelihood of sustaining serious losses and damage to critical assets earlier in conflict scenarios, frustrating escalation management.**

**The New High-Tech Arms Race:** Where their predecessors turned to conventional arms build-ups, today's major power strategists are similarly initiating a new arms race – this time in the weaponization of emerging technologies, like artificial intelligence (AI), robotics, directed energy, cyber warfare, orbital systems, and more. Though the capabilities sought are new, the objectives of this competitive, arms race-based strategy are old: secure competitive advantages and strengthen deterrence by curbing lower-level challenges.

Numerous analysts and observers have raised concerns about the effects of this course of action. They have pointed to the possibility of military cyber advancements undercutting strategic stability by impairing adversary nuclear command and control systems, to AI applications incentivizing first strikes and to the growing risk of inadvertent escalation

through "entanglement" of grey zone meddling with critical early warning system assets.

These analysts highlight important concerns, but they tend to focus on the effects of arms racing decisions and less on the questionable nature of the underlying strategic thinking guiding them. Some direct fundamental questions are too infrequently asked – is arms racing in emerging technologies a sound strategy? Does it enable the attainment of strategic advantage? Does it strengthen deterrence? And is it an effective use of massive expenditures? We use the US as our primary subject for exploring these questions, though they are equally applicable to the other powers and states entering the high-tech fray.

As the US Third Offset Strategy and 2017 National Security Strategy (NSS) make clear, a core objective of competitive development in emerging technologies is the achievement of strategic advantage. The NSS refers to this as "overmatch,"

or “the combination of capabilities in sufficient scale to prevent enemy success and to ensure that America’s sons and daughters will never be in a fair fight.” Despite its unprecedented defence spending, however, the US prospect of securing durable advantages, just like those of its fellow competitors, is illusory.

Just as the historical record shows in the nuclear and conventional arms race contexts, any advantage one state is able to carve out in the gamut of emerging technologies will almost certainly be ephemeral. The party that initially exploits a technical breakthrough in weapons design makes it easier for a competitor to field a comparable weapon. Particularly with modern advanced computing and accelerating additive manufacturing capacities, the first mover will only be providing proof of feasibility and general design information, however carefully this is guarded, which will allow adversaries to expeditiously develop comparable capabilities or asymmetric counters. Furthermore, unlike during the Cold War, competitors today, like the US and China, are better economically matched such that the prospect of outspending – and, thus, outracing – rivals is not realistic.

It is commonly argued that great power competition demands competitive arms development, but it should be noted that, in this context, there is a significant range of competitive intensity. In the US, the NSS and Joint Vision 2020 make clear that maximal superiority, expressed in terms of “overmatch” and “full spectrum dominance,” is the goal. This aggressive posture gives military establishments in Russia and China cover for correspondingly

ambitious, high-tech weapons programs, creating a vicious cycle of perpetual arms racing. To mitigate the costs and dangers of this chimeric quest for dominance, arms

competition should be constrained by rational calculus – not only by the finite nature of national funding resources. While it is hypothetically possible that clandestine weapons programs could deliver strategic surprises, modern surveillance technologies make any deployment of these secret capabilities very difficult.

**The party that initially exploits a technical breakthrough in weapons design makes it easier for a competitor to field a comparable weapon. Particularly with modern advanced computing and accelerating additive manufacturing capacities, the first mover will only be providing proof of feasibility and general design information**

If arms racing fails to yield durable competitive advantages, does it strengthen deterrence? Deterrence credibility is a function of capability and *will*. Arms racing strategies tend to focus myopically on the former while neglecting the latter. Formal theoretical analysis shows that the party with greater resolve (higher risk threshold) has the advantage, and analysts acknowledge that

it is “undoubtedly true” that US competitors, like China, enjoy asymmetry of interest in potential conflict hotspots inevitably located in their more immediate geographical regions.

That a strategy of increasing risk through progressively advanced capability development will enhance deterrence in a world where challengers possess similarly advancing capabilities, but different

**That a strategy of increasing risk through progressively advanced capability development will enhance deterrence in a world where challengers possess similarly advancing capabilities, but different risk tolerances, is far from clear. The failure of US deterrence strategy to deter Chinese salami-slicing in the South China Sea is illustrative of this fundamental asymmetry of interest problem.**

risk tolerances, is far from clear. The failure of US deterrence strategy to deter Chinese salami-slicing in the South China Sea is illustrative of this fundamental asymmetry of interest problem.

The above strategic questions aside, is high-tech arms racing economically sound? There is a powerful critique of unchecked high-tech arms racing based on development risk and misallocation of defence resources. High-tech

weapons are notable for difficult engineering challenges, great complexity and reliance on computer technology. Thus, such weapons development programs frequently exceed their budgeted costs and fail to meet completion schedules. Perverse incentives exist for arms vendors to promise unrealistic system deliverables, then request additional time and money to attain program goals.

Government sponsors of ambitious weapons programs are often politically trapped because their prestige is tied to program success, and cancellation of a mismanaged program reflects badly on their leadership. As a result, sponsors of troubled programs typically capitulate by providing additional funding, extending delivery schedules and relaxing program requirements. In the US, the problem-ridden F-35 fighter jet serves as a ready example. Over-budget programs also have the negative effect of diverting resources away from basic force sustainment functions, such as training, maintenance and supply logistics.

**Recommendations:** High-tech arms racing is a manifestation of deeply entrenched dogma that does not stand the test of strategic efficacy in the modern era. Like nuclear and conventional arms racing before it, arms racing in emerging technologies is strategically suspect, needlessly risky and economically wasteful. As the US, China and Russia become ever more embroiled in this burgeoning competition, Europe has a chance to assert itself as the champion of reason and lead the needed global charge for restraint and effective arms control in the high-tech sphere. Because Europe is relatively free of influential monolithic defence establishments, as compared with the US, Russia and China, it has greater political latitude in pursuing diplomatic and technical measures to constrain high-tech arms racing.

German Foreign Minister, Heiko Maas, has already proposed taking important initial steps in this direction. Mr Maas has highlighted the need for "rules" governing the increasing autonomy of advanced high-tech weapons systems under

development, as well as "universal norms and standards in cyberspace." Likening the implications of an unbridled high-tech arms race to the "ills of mankind" flowing from an opened Pandora's Box, Mr Maas has called for "frank and serious dialogue on the future of arms control" involving "parliamentarians and government representatives, as well as think tanks, researchers, military experts, and industry representatives."

While constraining military applications of emerging technologies will inevitably be challenging, a possible arms control agenda might focus as a point of departure on restricting the deployment of new families of advanced high-tech weaponry. While a prohibition on research and development in emerging capabilities is unrealistic, it is deployment that significantly increases costs and risks.

As technical capacity for verification improves, new arms control treaties could potentially curb competition in a range of high-tech weapons applications. The European Union, in concert with the United Nations, could play a crucial role in urging international cooperation needed to establish treaties and norms preventing deployment of destabilizing weapons technologies. We beseech all states to heed Mr Maas' call to action, to recognize the common interest in restraint and to avoid repeating the folly of previous futile, wasteful and dangerous arms racing!

*Source: <https://www.europeanleadershipnetwork.org/commentary/the-arms-race-in-emerging-technologies-a-critical-perspective/>, 09 February 2021.*

**OPINION – Dmitry Trenin**

**Dealing with Biden's America**

U.S. President Joe Biden's first major foreign policy speech did not contain any surprises. So far, Biden has been consistent in his talking

points. America is back. Diplomacy will be at the center of foreign policy. Washington will regain leadership of the Western world and consolidate it once again in the name of democracy. The US and its allies will deal with the principal challenge of authoritarianism, represented by China's ambitions and Russia's disruptive behaviour. At the same time, Washington will engage with its rivals and adversaries in Beijing and Moscow on U.S. interests or where U.S. national security demands it. America will also lead the world in responding to global challenges such as climate change, the pandemic, nuclear proliferation, and cyber security.

One genuinely new conceptual element in the presidential speech is the idea that U.S. foreign policy should correspond to the interests of the bulk of the American people — its middle class — but this is a domestic issue. Certainly, Biden also made it clear that the US will not cede its global primacy to China. So, the counter-offensive has begun.

**The idea that America is back may sound uplifting to a number of forlorn U.S. allies who for the past four years looked abandoned or neglected by their leader. To those sitting in Moscow, and probably Beijing, the US under Trump appeared very active indeed, of course, albeit in a spectacularly chaotic way.**

What should Russians make of it? The idea that America is back may sound uplifting to a number of forlorn U.S. allies who for the past four years looked abandoned or neglected by their leader. To those sitting in Moscow, and probably Beijing, the US under Trump appeared very active indeed, of course, albeit in a spectacularly chaotic way.

The notion of diplomacy as foreign policy's centrepiece is intriguing and somewhat perplexing. It should mean that military measures take a back seat to diplomatic and other non-violent action, but the Trump presidency actually stood out as a rare four-year period in which the US did not initiate any new wars. In this context, the Kremlin will probably interpret Biden's message as meaning that the United States will double down on waging non-military campaigns against its designated adversaries, including Russia.

Another likely conclusion is that the main thrust

of U.S. foreign policy has not changed much. The Trump administration called China and Russia America's major power rivals; Biden calls those two countries the principal opponents of the liberal and democratic order that the US supports and leads. In material terms, there is no change. There may and probably will be stylistic differences, but hardly substantial ones.

Beijing may encounter more flexibility in the future U.S. approach, but the fundamental antagonism will persist. Russia will continue to be subject to packages of U.S. sanctions, which under Biden promise to be smarter and more strategic. U.S.-Russian interaction on strategic stability issues, which the Democratic administration intends to address more seriously than its Republican

predecessor, will go hand-in-hand with persistent condemnation and retribution for what Biden calls Russia's determination to damage and disrupt American democracy.

Hopefully those two tracks will run in parallel, without

linkages leading to a train wreck. Like China, Russia will face a more united front of American allies. Biden's call for the immediate release of the jailed Kremlin critic Alexei Navalny has been echoed by Angela Merkel, Emmanuel Macron, Boris Johnson and many other Western leaders. The recent Navalny trial in Moscow was attended by diplomats from about twenty embassies.

To Moscow, this is a sign of blatant foreign interference in Russian domestic politics, and it is pushing back by refusing to listen to lectures and dismissing all accusations. This Western front, of course, is likely to be more unified on ideological issues than on issues of interest, but it will be harder for Moscow to play on inter-allied differences. The distinction between Russia's confrontation with the US and its alienation from the European Union is growing narrower.

At the same time, some elements of President Biden's speech suggest that there may be room



for Russia to cooperate with the US beyond strategic stability and arms control. This applies to such global issues as climate change; the COVID-19 pandemic; and nuclear non-proliferation.

Russia is affected by global warming more than many others, and while making use of its benefits, like melting Arctic ice, it is also seeking to deal with the negatives, such as melting permafrost in much of its territory. With its Sputnik V COVID-19 vaccine, Russia has demonstrated its capacity to deal with viruses.

Be that as it may, cooperation on climate and public health issues is not going to be very close or intense, and it will certainly not change the overall climate in U.S.-Russian relations, which is growing harsher. Nuclear non-proliferation, however, is a different story. Russia would welcome a U.S. return to the Iran nuclear deal, but it is not clear what exactly the Biden administration intends to do. The one major decision announced by the U.S. President in his first foreign policy address was stopping U.S. support for Saudi Arabia's war against the Yemeni Houthis, Iran's allies. At the same time, however, Biden reaffirmed Washington's commitment to Saudi security vis-à-vis Iran.

Moscow, which has been keeping in close contact with Tehran, continues to be a major player on the Iranian nuclear issue, and would have to be engaged by Washington if the US wants to resume its diplomatic efforts. Russia has far less influence in North Korea, of course, where Beijing is the principal outside actor, but Biden's White House is yet to roll out its strategy for dealing with that issue.

Overall, the Kremlin sees the Democratic

administration as more predictable and more professional on foreign and security policy than its predecessor. President Biden himself has been a well-known quantity in Moscow since the days of Leonid Brezhnev: not a friend of Russia by any stretch of the imagination, but, as a Cold War veteran, a safe pair of hands. The U.S. government, torn apart under Trump, suddenly looks consolidated now. Biden's key foreign policy figures, including Secretary of State Antony Blinken and National Security Adviser Jake Sullivan, are his former aides and will be loyal to their boss.

The Democratic Party controls both houses of U.S. Congress. Both traditional media and social media companies are overwhelmingly Democrat-friendly, adding to the victors' bloc. That said, the general attitude in Washington toward Russia will remain adversarial, and openly supportive of the Kremlin's domestic opponents. At the same time, Biden's policy is expected to be cautious when it comes to U.S. national security, and potentially even pragmatic where U.S. interests are involved. The Kremlin will be on its guard, but can probably live with that.

Source: <https://www.themoscowtimes.com/2021/02/08/dealing-with-bidens-america-a72860>, 08 February 2021.

**Some elements of President Biden's speech suggest that there may be room for Russia to cooperate with the US beyond strategic stability and arms control. This applies to such global issues as climate change; the COVID-19 pandemic; and nuclear non-proliferation.**

**President Biden himself has been a well-known quantity in Moscow since the days of Leonid Brezhnev: not a friend of Russia by any stretch of the imagination, but, as a Cold War veteran, a safe pair of hands. The U.S. government, torn apart under Trump, suddenly looks consolidated now.**

**OPINION – Jayita Sarkar**

**How to Support the Treaty on the Prohibition of Nuclear Weapons without Signing**

The TPNW, which outlaws nuclear weapons, entered force just after Biden's inauguration. Although the Biden administration is highly unlikely to adhere to it directly, can it take smaller steps in line with the TPNW's goals?

The TPNW entered into force on Jan. 22, 2021,

only two days after a new U.S. administration was sworn in. The treaty is the first multilateral legal document to outlaw nuclear weapons. How will the Biden administration respond now that it is international law? In recent weeks, former policymakers, including former Secretary of Defense William Perry and former Undersecretary of State for International Security and Non-proliferation Thomas Countryman, have called for the Biden administration to adopt a supportive position on the TPNW. Critics of the treaty, such as then-U.S. Ambassador to the UN Nikki Haley, have called for proactive opposition, or at least benign neglect. But perhaps there is a third option that the administration could consider: the middle ground of selective support.

President Obama's famous Prague Speech in 2009 called for a world without nuclear weapons, but his administration opposed the multilateral efforts at the U.N. General Assembly that led to the TPNW. U.S. policymakers argued that a nuclear weapons ban was contrary to U.S. national interests and those of countries that possessed or stationed nuclear weapons. They worried that the nuclear weapons ban could weaken the 1968 Treaty on the NPT, considered to be the cornerstone of the nuclear multilateral regime.

The Trump administration boycotted the U.N. General Assembly negotiations in 2017, along with the UK, France, South Korea, and other U.S. allies and friends. When the 50th country ratified the TPNW in October 2020, paving the way for the treaty to become international law, the U.S. government urged countries that had already ratified the TPNW to withdraw support. All nine

countries that possess nuclear weapons oppose the TPNW, as do those that host nuclear weapons because of security guarantees they enjoy from major powers, such as U.S. NATO allies.

When the world is viewed solely through the prism of nuclear deterrence, the TPNW seems unrealistic and its supporters appear as impractical idealists. The TPNW, though, was developed from the approach that foregrounds the "humanitarian consequences" of nuclear weapons. This approach encompasses much more than the notion of a fragile balance of power maintained by nuclear weapons. Much of the treaty is about the effects of nuclear weapons and nuclear explosive devices on the human body. The Biden administration can show its selective support on this issue, breaking with the policy of the past two U.S. administrations.

**U.S. policymakers argued that a nuclear weapons ban was contrary to U.S. national interests and those of countries that possessed or stationed nuclear weapons. They worried that the nuclear weapons ban could weaken the 1968 Treaty on the NPT, considered to be the cornerstone of the nuclear multilateral regime.**

**When the world is viewed solely through the prism of nuclear deterrence, the TPNW seems unrealistic and its supporters appear as impractical idealists. The TPNW, though, was developed from the approach that foregrounds the "humanitarian consequences" of nuclear weapons.**

The US is responsible for the atomic bombings of Hiroshima and Nagasaki in August 1945 and for 1,032 nuclear weapons tests that took place between 1945 and 1992. The majority of the tests were conducted in New Mexico, Nevada, Alaska, and the Pacific Ocean. Article 6 of the TPNW, entitled "Victim assistance and environmental remediation," calls on state parties to "adequately provide age- and gender-sensitive assistance, without discrimination, including medical care, rehabilitation and psychological support, as well as provide social and economic inclusion" to those affected by nuclear weapons and nuclear explosive devices.

Providing assistance to victims of radiation in the United States has been a slow, arduous and

incomplete process. The Radiation Exposure Compensation Act (RECA) was passed only in October 1990 and expanded in 2000. Administered by the U.S. Department of Justice, RECA provides one-time benefits payments to those who have developed cancers and specified diseases as a consequence of radiation exposure caused by nuclear weapons testing and uranium mining, milling or transporting. RECA has provided \$2.4 billion in benefits to more than 37,000 claimants since 1990 but is expected to sunset in July 2022.

RECA itself has several limitations. First, it has a narrow definition of “downwinders”—the individuals living downwind of the Nevada Test Site who are eligible for compensation. Downwinder-eligibility requires individuals to have a diagnosis of a compensable disease caused by radiation exposure and proof of residence in selected counties of Arizona, Nevada, and Utah during the period of atmospheric testing at the Nevada Test Site. Second, RECA denies compensation to victims of uranium mining after 1971, when the U.S. Atomic Energy Commission’s mining activities were transferred to commercial firms.

The 2020 Democratic Party platform explicitly called for increasing victim assistance under RECA. More broadly, the platform also pledged the party to “pursuing environmental justice and climate justice, including for Indigenous peoples and communities.” Given that the majority of downwinders and uranium miners are from Indigenous communities in the United States, the Democratic Party’s commitment to “protecting Native American health” is compatible with the humanitarian consequences approach to nuclear weapons. Moreover, for the first time in its history, the Department of the Interior, the federal agency responsible for appropriation of Indigenous lands since the 19th century westward expansion, will have a Native American head—Rep. Deb Haaland,

an enrolled citizen of the Pueblo of Laguna. Haaland and her fellow Democrats from New Mexico have been proactive in pushing for legislation to expand radiation compensation. In other words, the Biden administration has already promised to act on the humanitarian consequences of nuclear testing in the United States. If the administration delivers on its promise, it would be addressing commitments covered in Article 6 of the TPNW, even without signing the treaty.

The TPNW is a multilateral treaty, which requires policy harmonization through domestic legislation to be implemented. RECA offers pre-existing legal infrastructure on which the Biden administration can build and, with its inclusion of uranium mining, even corrects a major weakness of the TPNW, which focuses solely on victims of nuclear weapons and nuclear explosive devices.

To be sure, promoting an expanded RECA as evidence of U.S. selective support for the TPNW would require diplomatic finesse at the United Nations. But, if backed by political will, the State Department under Secretary of State Antony Blinken, Deputy Secretary of State-designee Wendy Sherman, and Undersecretary-designee for Arms Control and International Security Affairs Bonnie Jenkins will have the wherewithal for it. Selective U.S. support to the TPNW would be an unusual approach toward a new treaty, but it would not be unprecedented. In 1968, when the NPT was first opened for signature, France refused to sign it.

The Charles de Gaulle government had already been boycotting for several years the negotiations at the Eighteen Nations Disarmament Committee in Geneva, Switzerland, that led to the NPT. The French representative, Armand Béard, however, declared that even though France was not going to accede to the NPT, it would responsibly act as if it were a signatory. U.S. policymakers were

**Given that the majority of downwinders and uranium miners are from Indigenous communities in the United States, the Democratic Party’s commitment to “protecting Native American health” is compatible with the humanitarian consequences approach to nuclear weapons.**

disdainful of the French approach to the NPT during the Cold War, especially after France's withdrawal from NATO's integrated command structure two years before. Nevertheless, the measure did not completely preclude France's future accession to the NPT, which eventually took place in 1992.

**According to a 2020 poll by the Chicago Council on Global Affairs, 66 percent of Americans want a world without nuclear weapons. The present moment offers the promise of unprecedented change in global nuclear politics.**

By selectively supporting the TPNW through Article 6 commitments while not acceding to it, the Biden administration can be at the forefront of an anti-racist global nuclear agenda. It can promote the U.S. image abroad, which has been tarnished by the Trump administration's four years of isolationist "America First" rhetoric. It could also win support at home. According to a 2020 poll by the Chicago Council on Global Affairs, 66 percent of Americans want a world without nuclear weapons. The present moment offers the promise of unprecedented change in global nuclear politics. When the 10th NPT Review Conference takes place in New York in August 2021 (postponed from 2020), it will be the first time in the history of the nuclear age that there will be *another nuclear treaty* demanding attention and action. The Biden administration could seize the day and make history.

Source: <https://www.lawfareblog.com/how-support-treaty-prohibition-nuclear-weapons-without-signing-it>, 07 February 2021.

## **NUCLEAR STRATEGY**

### **FRANCE**

#### **French Nuclear Submarine Patrolled in South China Sea**

A French nuclear-propelled attack submarine and warship patrolled in the South China Sea to

underscore freedom of navigation in international waterways, the Armed Forces Ministry said on 09 February. Earlier in the day, the U.S. navy had said two U.S. carrier groups conducted joint exercises in the South China Sea, days after a U.S. warship sailed near Chinese-controlled islands in the disputed waters. The latest French passage is a sign that U.S. allies are increasingly asserting freedom of navigation in international waterways near China.

"This strategy is based in particular on operational commitments, on a tradition of cooperation with regional states and on defense diplomacy which contributes in particular to support multilateralism, international law and the principle of freedom of navigation," the French Armed Forces ministry said.

**This strategy is based in particular on operational commitments, on a tradition of cooperation with regional states and on defense diplomacy which contributes in particular to support multilateralism, international law and the principle of freedom of navigation," the French Armed Forces ministry said.**

China has been infuriated by repeated U.S. sailings near the islands it occupies and controls in the South China Sea, saying it has irrefutable sovereignty and accusing the US of

deliberately stoking tension. The French Emeraude submarine was supported by a warship as part of an eight-month mission that also includes passages in the Indian and Pacific Oceans. Armed Forces Minister Florence Parly said on Twitter it showed the capacity of the French Navy to operate far away and in cooperation with its American, Australian and Japanese allies.

Source: <https://www.reuters.com/article/southchina-sea-france-submarine/french-nuclear-submarine-patrolled-in-south-china-sea-navy-idUSL1N2KF1J7>, 09 February 2021.

### **RUSSIA-USA**

#### **The Risk of Nuclear Cataclysm is Increasing**

The world can breathe a small sigh of relief. The last remaining arms control treaty between the U

S and Russia, called New START, will not expire on Feb. 5 after all, as recently feared. In the nick of time, Russian President Vladimir Putin offered his new American counterpart an extension of the treaty for five years, an option stipulated in its text. Joe Biden agreed — after giving Putin the requisite talking to about Russia's massive cyberattack on the United States, its jailing of the activist Alexey Navalny and other recent outrages.

In the short term, a new nuclear arms race between the two biggies has thus been avoided. Sort of. But not really — and there's the rub. A wider glance at the world's nuclear landscape reveals that the danger of cataclysm, by design or accident, keeps growing.

New START only covers the stockpiles of Russian and American "strategic" weapons. This refers to those warheads the two adversaries point at each other's homeland. The treaty says nothing about "tactical" nukes, the more flexible and usually smaller warheads built for potential use in a war zone to win or avoid losing a conventional conflict. But in that tactical category an arms race is already underway.

Both the U S and Russia, in the name of upgrading their arsenals, have been designing new tactical nukes and deployment technologies. These include things that were science-fiction during the Cold War, such as nukes delivered by drones from submarines. This race is thus fundamentally different from the one between the US and the Soviet Union. Back then, the contest ultimately came down to a count of each side's warheads. What ultimately stabilized that competition was the macabre but compelling logic of deterrence through MAD. Today's

**In the nick of time, Russian President Vladimir Putin offered his new American counterpart an extension of the treaty for five years, an option stipulated in its text. Joe Biden agreed — after giving Putin the requisite talking to about Russia's massive cyberattack on the United States.**

**Today's competition is instead between new-fangled technologies and, crucially, the military strategies thus made possible. This multiplication of scenarios and permutations undermines traditional calculations of strategy, which were largely based on the tools of game theory developed during the Cold War.**

competition is instead between new-fangled technologies and, crucially, the military strategies thus made possible. This multiplication of scenarios and permutations undermines traditional calculations of strategy, which were largely based on the tools of game theory developed during the Cold War.

One upshot is that it's becoming even more important for all nine of the nuclear powers to "signal" their "postures," in the jargon. They should explain their intentions and make themselves as predictable

as possible to others. And yet the most recent such signalling was hardly reassuring. In Article 4 of its Basic Principles issued in 2020, Russia asserts that one purpose of its nuclear arsenal is "the prevention of an escalation of military actions and their termination on conditions that are acceptable for the Russian Federation." Translated, this wording suggests that Russia could respond to a conventional conflict with a tactical nuclear strike, as opposed to reserving nukes purely for retaliation in kind. But that makes any altercation potentially explosive in the fissile sense.

A conflict could, for instance, start with hybrid warfare (of the sort Russia used in its 2014 annexation of Crimea), or with cyberwar (as waged during last year's Russian hack of some 18,000 U.S. computer systems) or with a strike in space against an adversary's satellites. If the

conflagration escalates and becomes "unacceptable," the next step could be nukes. And then?

The first strike would still detonate somewhere — perhaps in the Baltic region, according to one hypothetical conflict between Russia and NATO.

For the local population that would be far from “tactical,” and indeed terminal. It would also demand a response from the alliance.

But should that response be a nuclear counterstrike? At what scale? Against Russian forces, or a city? Moreover, how would Russia, in this hypothetical scenario, react to this “limited” NATO counterstrike? With missiles flying at supersonic speeds, all involved would have at most minutes to decide. To make the global matrix even more complex, there are also the other seven nuclear powers to consider, and perhaps additional ones in future. Of these North Korea may appear to be the most unhinged. But China is the most ambitious. It could have 350 warheads already, according to some estimates. The Pentagon assumes China will double its arsenal in the coming decade.

China is the main reason why the U S and Russia couldn't agree on properly renegotiating New START. Donald Trump, Biden's predecessor, insisted on bringing Beijing into the talks. The Chinese refused. Sarcastically, they wondered aloud whether the Americans and Russians would prefer to let China raise its arsenal to their size or to cut their own down to China's.

That makes for a good news conference zinger in Beijing. But it won't help humanity get to grips with its conundrum: More actors are getting more weapons with more technological and tactical applications. The risk that somebody, somewhere pulls a trigger, intentionally or inadvertently, keeps rising. In a gesture of global protest against this insanity, 86 non-nuclear countries have signed a Treaty on the Prohibition of Nuclear Weapons, with a goal of totally banning these satanic arms. It took effect on Jan. 22. But these — mainly smaller and poorer — states don't hold the future in their hands. The big nuclear powers do. They must put their daunting other differences aside and begin comprehensive talks to prevent the worst. And the best placed to extend the invitation is the leader who's newest in office,

and yet has the most experience with disarmament: Biden.

Source: *Andreas Kluth*, <https://www.japantimes.co.jp/opinion/2021/02/07/commentary/world-commentary/us-russia-china-nuclear-weapons-arms-control/>, 07 February 2021.

## BALLISTIC MISSILE DEFENCE

### CHINA

#### China Conducts Land-Based, Mid-Course Missile

The Chinese Defense Ministry has completed a test launch of a land-based, mid-course missile interception. China's official state-run news agency Xinhua cited the ministry as saying that the test was held 'within its territory and achieved the desired test objective' on 4 February. The ministry also confirmed that the missile intercept test was 'defensive in nature' and not intended to target any country.

This was the fourth land-based, mid-course ABM technical test that has been publicly announced by China. The previous four tests were completed in 2010, 2013, 2014 and 2018. The ministry did not

disclose any technical details about the test. According to South China Morning Post (SCMP), the authorities issued a 'no-fly warning' near the Taiyuan Satellite Launch Centre in north China prior to testing. An anonymous Chinese military source was quoted by SCMP as saying: "This is a technology that China has been developing for a long while."

Source: <https://www.army-technology.com/news/china-conducts-land-based-mid-course-missile-interception-test/>, 05 February 2021.

### SOUTH KOREA

#### S. Korean Defense Ministry Releases 2020 White Paper

North Korea has expanded its ballistic missile units, strengthened special forces with modernized equipment and reinforced exercises to attack strategic targets, such as South Korea's presidential

**Of these North Korea may appear to be the most unhinged. But China is the most ambitious. It could have 350 warheads already, according to some estimates. The Pentagon assumes China will double its arsenal in the coming decade.**

office. These were some of the changes in the North Korean military outlined in the 2020 edition of South Korea's biennial defense white paper that the Defense Ministry unveiled online and offline. The document noted that North Korea now has 13 missile brigades under its strategic force command, an addition of four units since 2018.

The units are believed to operate short-range Scud missiles that aim to strike South Korean targets, Rodong missiles with a range of around one-thousand-300 kilometers and Musudan missiles that can fly three-thousand kilometers, putting the strategic U.S. military base in Guam within range.

The defense white paper also compares the military capacities of the two Koreas. North Korea has two-point-three times more reserve forces compared to the South Korean Army - around one-point-28 million to 555-thousand, as of late last year. The North has larger capacity in terms of field artillery and multiple rocket launchers, but the South exceeds in advancement as it continues to acquire and develop cutting-edge weapons.

Seoul and Washington have drawn up "customized deterrence strategies," as Pyongyang reinforces its asymmetric power, including nuclear arms, WMD and various ballistic missiles. The South Korean military is establishing strategically guided munitions and a domestically developed missile defense system for independent deterrence. Meanwhile, the Moon Jae-in administration avoided directly referring to North Korea as an enemy in the paper, though it does reiterate its 2018 stance that the military considers forces that threaten or violate South Korea's sovereignty, territory, people and property as an enemy. Amid frayed Seoul-Tokyo relations over historical and trade issues, the paper referred to Japan as a "neighboring country," rather than a "partner" as mentioned in the past, with which to cooperate on peace and prosperity in Northeast Asia and beyond. It said Seoul will sternly respond to Tokyo's historical distortions, false claim to the Dokdo islets and unilateral and arbitrary actions on pending issues.

Source: [http://world.kbs.co.kr/service/news\\_view.htm?lang=e&Seq\\_Code=159319](http://world.kbs.co.kr/service/news_view.htm?lang=e&Seq_Code=159319), 02 February 2021.

## **TURKEY**

### **Turkey Signals US it's Ready to Compromise on S-400 Missile Systems**

Turkey is signalling that it could give ground on the Russian missiles it's poised to deploy if the US severs support for Kurdish forces Ankara views as a mortal threat. The Turkish government is prepared to make concessions, such as agreeing to limited use of the Russian S-400 anti-aircraft

missiles, because it's eager to secure the future supply of spare parts for its US-made weapons systems and avoid damage to its economy, according to two Turkish officials familiar with relations between the countries. Ankara is also keen to prevent

**The Turkish government is prepared to make concessions, such as agreeing to limited use of the Russian S-400 anti-aircraft missiles, because it's eager to secure the future supply of spare parts for its US-made weapons systems and avoid damage to its economy.**

Washington from further strengthening Syrian Kurdish YPG fighters that dominate the US-backed force that quelled ISIS terror group in Syria, they said, speaking on condition of anonymity to discuss strategic issues.

The country's banking stocks index rallied as much as 3.4 per cent amid heightened hopes of a thaw with the US. Halkbank, facing US criminal prosecution over alleged Iran sanctions violations, was up 2.1 per cent. Defence Minister Hulusi Akar cited the installation of an earlier generation of Russian missiles for limited use in Greece as a possible model. "We said we are open to negotiation," Mr Akar said in an interview with the Hurriyet newspaper published February 09. ...

US ambassador David Satterfield told Turkish media that Washington's policy of working with Syrian Kurdish forces has not changed and that Turkey would have to get rid of its S-400s if it wants related US sanctions lifted. US President Joe Biden and Congress have both taken a hard line on Turkey, in part over its acquisition of the Russian S-400 missiles, which Washington says could gather intelligence on Western military

capabilities, including Lockheed Martin Corp's F-35 stealth fighter jet.

American support for YPG fighters is a key area of conflict because of the force's link to another Kurdish separatist movement that Turkey has been fighting for more than three decades. That group, the Kurdistan Workers' Party, or PKK, is classified as a terrorist organisation by the US and EU. Strains between Ankara and Washington can't be eased without resolving these two issues, Mr Akar said.

...

... YPG forces seized chunks of territory along the Syrian border with Turkey in the course of Syria's civil war. The Turkish military test-fired the S-400 batteries in October, but hasn't yet activated them. The US has retaliated against the S-400 purchase by imposing sanctions on Turkey's defence industry and suspending its role in manufacturing the F-35.

President Recep Tayyip Erdogan said last month that Turkey and Russia would hold talks on issues including the delivery of a second batch of S-400 missile-defence systems at the end of January. It was not clear whether those talks have been postponed or cancelled. Turkey acquired the first system from Moscow in 2019 after dropping talks for a comparable US Patriot system because Washington refused to share technology.

Source: <https://www.straitstimes.com/world/middle-east/turkey-signals-us-its-ready-to-compromise-on-s-400s>, 09 February 2021.

## **NUCLEAR ENERGY**

### **INDIA**

#### **Nuclear Energy Production in India**

Union Minister of State...Dr. Jitendra Singh said nuclear energy is an important component of the

country's energy mix and is being pursued along with other sources of energy in an optimal manner. In a written reply to a question in the Lok Sabha on 03 February, he said, Nuclear energy is a clean, environment friendly base load source of power available 24X7. It also has huge potential which can ensure long term energy security of the country in a sustainable manner.

There are presently 22 reactors with a total capacity of 6780 MW in operation and one reactor, KAPP-3 (700 MW) has been connected to the grid on January 10, 2021. In addition, there are 8 reactors (including 500 MW PFBR being implemented by BHAVINI) totalling to 6000 MW under construction at various stages. The Government has accorded administrative approval and financial sanction for construction of 12 nuclear power reactors – 10 indigenous 700 MW PHWRs to be set up in fleet mode & 2 units of LWRs to be set up in cooperation with Russian Federation. On progressive completion of the projects under construction and accorded sanction, the nuclear capacity is expected to reach 22480 MW by 2031.

The Government has also accorded 'In-Principle' approval for five new sites for locating nuclear power plants in future.

Source: Suman Munshi, <http://ibgnnews.com/2021/02/04/nuclear-energy-production-in-india/>, 04 February 2021.

### **JAPAN**

#### **Japan Needs Nuclear Power, Says Energy Minister**

Japan's energy minister said that he considers nuclear energy "indispensable" if the country is to meet its target of reaching net-zero carbon emissions by 2050. Speaking to the *Financial Times*, Hiroshi Kajiyama said power shortages in

**The Turkish military test-fired the S-400 batteries in October, but hasn't yet activated them. The US has retaliated against the S-400 purchase by imposing sanctions on Turkey's defence industry and suspending its role in manufacturing the F-35.**

**On progressive completion of the projects under construction and accorded sanction, the nuclear capacity is expected to reach 22480 MW by 2031. The Government has also accorded 'In-Principle' approval for five new sites for locating nuclear power plants in future.**



January due to heavy snowfall highlighted Japan's need for nuclear.

Prior to the March 2011 accident at the Fukushima Daiichi plant, Japan's nuclear generating capacity had provided around 30% of the country's electricity. However, within 14 months of the accident, the country's nuclear generation had been brought to a standstill pending regulatory change. So far, nine of Japan's 39 operable reactors have cleared inspections confirming they meet the new regulatory safety standards and have resumed operation. Another 18 reactors have applied to restart. In 2019, nuclear energy provided just 7.5% of the country's electricity.

Japan's *Basic Energy Plan*, set in 2018 and due for revision in 2021, targets 22-24% of its energy to come from renewables by 2030, along with 20-22% from nuclear power and 56% from fossil fuels. In his interview with the *Financial Times*, published on 02 February 2021 Kajiyama said: "Personally, I think nuclear power will be indispensable." He described Japan's electricity supply as "touch-and-go" during heavy snowfall last month, which resulted in high electricity prices and tight supplies in some areas of the country. "Solar wasn't generating. Wind wasn't generating. I'm trying to persuade everybody that in the end we need nuclear power."

Analysis by the Ministry of Economy, Trade and Industry (METI) has shown it will be hard to supply more than 60% of Japan's electricity needs from renewable energy sources. Referring to the country's lack of flat, empty land for solar panels and the deep oceans that surround it, Kajiyama said: "Japan's geographical constraints mean it is not as easy to introduce renewables as in

Europe or North America." In a policy speech to the country's parliament on 26 October 2020, newly-elected Prime Minister Yoshihide Suga declared Japan will aim to reduce greenhouse gas emissions to net zero by 2050. This will involve an increase in the share of renewables to 50% by 2030, he said. ... "Addressing climate change is no longer a constraint on economic growth. We need to adjust our mindset to a paradigm shift that proactive climate change measures bring transformation of industrial structures as well as our economy and society, leading to dynamic economic growth."

**In a policy speech to the country's parliament on 26 October 2020, newly-elected Prime Minister Yoshihide Suga declared Japan will aim to reduce greenhouse gas emissions to net zero by 2050. This will involve an increase in the share of renewables to 50% by 2030, he said.**

...Japan will need nuclear power if it is to realise the government's carbon neutrality goal and should therefore restart idled nuclear reactors as soon as possible, as well as work to extend their operating lifetimes and build new nuclear capacity, the heads of the Japanese Atomic Industry Forum and the Japan Iron and Steel Federation said in separate New Year messages.

Source: <https://world-nuclear-news.org/Articles/Japan-needs-nuclear-power-says-energy-minister>, 03 February 2021.

**The Ukrainian government is planning to build huge data centers next to its nuclear power plants to host state documents and mine cryptocurrency. Official statements call for facilities between 250MW and 500MW, with the state-owned utility Energoatom saying that total energy consumption across the mining facilities could reach 2-3GW.**

## **UKRAINE**

### **Ukraine Plans Huge Cryptocurrency Mining Data Centers Next to Nuclear Power Plants**

The Ukrainian government is planning to build huge data centers next to its nuclear power plants to host state documents and mine cryptocurrency. Official statements call for facilities between 250MW and 500MW, with the state-owned utility Energoatom saying that total energy consumption across the mining facilities could reach 2-3GW. Details on the cryptocurrency projects are limited.

Nuclear-Powered Bitcoin: In May 2020, acting head of the Ministry of Energy Olga Buslavets

signed an order to study the “possible implementation of cryptocurrency mining projects in order to provide additional sales markets for electricity produced by the nuclear power plant.”

The agency said that it hoped that the data centers would help use idle load and reduce the burden on transmission systems – but that they would require a minimum of 100MW in power.

That summer, Energoatom’s acting president, Petro Kotin, signed an MoU with H2 LLC to build a \$700m data center near the Zaporizhzhia Nuclear Power Plant, Europe’s largest nuclear power plant, located just 200km from the ongoing war in Donbass. Little is known about local company H2, which will also build a \$300m hydrogen electrolysis plant. ...

**The History of Nuclear Data Centers:** The push for state-sanctioned mining comes after Ukraine’s internal security service, the SBU, discovered an illegal bitcoin mining operation going on inside one of Energoatom’s power plants. The year before, Russian nuclear engineers were arrested for using a supercomputer at a nuclear laboratory to mine bitcoin. Russia is also turning to its ample nuclear power plant infrastructure for on-site data centers. In 2019, Rostelecom Data Centres opened a facility on the grounds of the Kalininskaya Nuclear Power Plant, with 48MW of power capacity and space for 4,800 racks by the end of 2021. Should it reach that goal, despite multiple delays, that will make it Russia’s largest data center. That facility, however, appears more geared towards standard colocation and cloud workloads than cryptocurrency mining.

Source: Sebastian Moss, <https://www.datacenterdynamics.com/en/news/ukraine-plans->

*huge-cryptocurrency-mining-data-centers-next-nuclear-power-plants/, 01 February 2021.*

## NUCLEAR COOPERATION

### EU–BELARUS

#### Political Rhetoric over Astravets NPP Belies EU-Belarus Technical Cooperation

The Astravets nuclear power plant in Belarus, built by Russia’s Rosatom, officially began operating last November but nonetheless remains the subject of heated disagreement between Minsk and neighbouring Lithuania. Top Lithuanian officials, including president Gitanas

Nausėda, are harshly critical of the facility and its proximity to their country’s capital, and successive governments in Vilnius have lobbied their neighbours – and the European Union as a whole – to join them in opposition to Astravets.

With the NPP now producing electricity, Lithuania’s objective has shifted to keeping electricity from the plant out of Baltic grids. Against the backdrop of broader political tensions between the EU and the government of Belarus, Lithuania and its allies in the Industry, Research and Energy (ITRE) committee of the European Parliament are now putting forward the latest in a series of parliamentary resolutions opposing Astravets as a “geopolitical project.”

As has long been the case with the European debate surrounding Astravets, however, there is a noticeable disconnect between the dire warnings emanating from Vilnius and the EU’s own tone in discussing its engagement with Minsk on the newly minted Belarusian nuclear facility.

European Commission and European Nuclear

**The push for state-sanctioned mining comes after Ukraine’s internal security service, the SBU, discovered an illegal bitcoin mining operation going on inside one of Energoatom’s power plants. The year before, Russian nuclear engineers were arrested for using a supercomputer at a nuclear laboratory to mine bitcoin.**

**Against the backdrop of broader political tensions between the EU and the government of Belarus, Lithuania and its allies in the Industry, Research and Energy (ITRE) committee of the European Parliament are now putting forward the latest in a series of parliamentary resolutions opposing Astravets as a “geopolitical project.”**

Safety Regulators Group (ENSREG) involvement with Astravets: As European Commissioner for Energy Kadri Simson told the European Parliament last March, Gosatomnadzor – the Belarusian nuclear regulatory authority – has been receiving technical assistance from the EU itself within the framework of the Instrument for Nuclear Safety Cooperation. As the ENSREG also explained in its 2018 report on stress tests in Belarus, the group's mandate to evaluate the Astravets project is based on Minsk's own decision to volunteer for the process, despite not being an EU country.

With the plant now operational, cooperation between Belarus and the EU is continuing. A planned December visit to the site by ENSREG's nuclear safety experts is now taking place this month, and ENSREG's evaluations of the facility to date – including its most recent draft report on Astravets from the end of last year – have been largely positive, with EU officials telling Bloomberg their Belarusian counterparts are moving to address all seven major recommendations to emerge from EU stress testing of the site's safety protocols.

Belarus' implementation of those recommendations is the subject of ENSREG's newest draft report on the country's National Action Plan for the NPP (itself based on ENSREG findings). The report, planned for publication after the rescheduled site visit, specifies that six of the seven "high priority issues" to arise from stress testing have already been "adequately addressed" by the Belarusian side, covering the NPP's safety systems as well as protocols for handling major incidents. ENSREG names just one area – covering earthquakes – as still under assessment pending the site visit, although the report points out that Astravets' capacity to resist seismic shocks (up to a maximum peak acceleration, or PGA, of 0.12g) surpasses the 0.1059g seismic benchmark it recommends for use at the site.

The rhetoric from Lithuania and other EU member states in the region does not reflect this engagement between the European Commission, ENSREG, and Belarus on the Astravets plant. Instead, statements from Lithuanian officials regarding the threat ostensibly posed to their country seem to have influenced views of Astravets among many MEPs, pushing them to oppose the project and doubt the validity of the collaboration already taking place between Brussels and Minsk to ensure the safety of eastern Europe's newest NPP.

Double standards on the treatment of nuclear power? For example, the language of the resolution now being considered by the European Parliament – drafted by Romanian MEP Cristian Buşoi – describes the NPP (which it refers to as Ostrovets) as a "source of possible threat to the European Union and its Member States with regard to safety, health and protection of the environment" and claims the plant "does not comply with the highest international environmental and nuclear safety standards," calling for its operations to be suspended until all recommendations from ENSREG's stress testing are fully implemented – a condition ENSREG itself does not impose.

As ENSREG points out in its draft report, the regulatory group's findings are not meant to authorise or prevent the authorisation of nuclear plants. Rather, the report emphasises "that a stress test exercise remains a targeted exercise reviewing the safety of certain aspects of a nuclear power plant... with the objective of further safety enhancement. A stress test and the implementation of follow up actions should not be used to justify or authorise the safe operation of a nuclear power plant nor its long-term operation or lifetime extension."

Buşoi's resolution nonetheless builds on a narrative thread established by a number of other

**The rhetoric from Lithuania and other EU member states in the region does not reflect this engagement between the European Commission, ENSREG, and Belarus on the Astravets plant. Instead, statements from Lithuanian officials regarding the threat ostensibly posed to their country seem to have influenced views of Astravets among many MEPs, pushing them to oppose the project and doubt the validity of the collaboration.**

EP statements regarding Astravets, including a resolution adopted in October 2020 which castigated Belarus' "construction of unsafe nuclear installations" and "lack of respect for international standards for nuclear safety," calling into question the country's implementation of recommendations put forward by ENSREG – despite ENSREG's own indications to the contrary.

The discord between the political rhetoric surrounding Astravets and the concrete safety recommendations put forward by European nuclear safety experts feeds into a broader trend against nuclear energy in the European Union, even though a number of EU countries rely on comparable NPPs to meet a significant portion of their own electricity needs.

The same VVER-1200 reactor model installed at Astravets is also being used at the Hanhikivi NPP in Finland, while older VVER-213 and VVER-320 reactors are currently in use at NPPs including Hungary's Paks, Slovakia's Bohunice and Mochovce, and Czechia's Dukovany and Temelin. While it remains to be seen whether ENSREG's latest visit to Astravets will set minds in Lithuania and in the European Parliament at ease, past experience suggests that is unlikely. Instead, the political discourse and the concrete technical findings surrounding the NPP seem to be following divergent tracks, with the latter having little impact on the former.

Source: *Craig Turp-Balazs*, <https://emerging-europe.com/news/political-rhetoric-over-astravets-npp-belies-eu-belarus-technical-cooperation/>, 11 February 2021.

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Iran Producing Uranium Metal, Further Violating 2015 Deal: IAEA**

Iran has started producing uranium metal, the UN nuclear watchdog said on 10 February, in a fresh breach of the limits laid out in Tehran's 2015 deal with world powers.

The latest violation of the deal aimed at preventing Tehran from developing nuclear weapons comes days after US President Biden made clear he would not lift sanctions against Iran unless it first adheres to agreement's commitments. The Vienna-based IAEA said in a statement seen... that on February 8 it "verified 3.6 grammes of uranium metal at Iran's Fuel Plate Fabrication Plant in Esfahan".

IAEA Director General Rafael Grossi informed member states of the new violation, the statement added. Iran has previously said its research on uranium metal production was aimed at providing advanced fuel for a research reactor in Tehran.

But the topic is sensitive because uranium metal can be used as a component in nuclear weapons.

The deal says that after 10 years Iran would have been allowed to initiate research on producing uranium metal-based fuel "in small agreed quantities" but only

if the other parties - the US, China, Russia, Germany, France and Britain - had given approval. The new violation comes a month after Iran announced it had stepped up its uranium enrichment process to 20 percent purity, far above the 3.67 percent level permitted by the deal, but far below the amount required for an atomic bomb. In 2018 US President Trump dramatically withdrew from the Iran nuclear deal and reimposed crippling economic sanctions on Tehran. The following year Tehran announced it would start breaking the deal's limits on nuclear activity.

Trump's successor Biden is seeking to revive the agreement, but the two sides appear to be in a standoff over who acts first. "If they want Iran to return to its commitments... the US must entirely lift the sanctions, in practice and not on paper," supreme Iranian leader Ali Khamenei said... When Biden was asked...whether he would halt sanctions to convince Iran to return to the bargaining table, Biden offered a clear reply: "No."

Source: <https://www.arabnews.com/node/1807216/middle-east>, 11 February 2021.

**If they want Iran to return to its commitments... the US must entirely lift the sanctions, in practice and not on paper," supreme Iranian leader Ali Khamenei said.... When Biden was asked...whether he would halt sanctions to convince Iran to return to the bargaining table, Biden offered a clear reply: No.**

**Russia Eyes Close Cooperation with EU on JCPOA, Lavrov Says**

The chief Russian diplomat said that his country would continue to work with the EU on the 2015 nuclear deal with Iran and hopes that the US would decide to return to the deal in the near future. Speaking at a joint news conference with EU foreign policy chief Josep Borrell in Moscow, Russian Foreign Minister Sergei Lavrov said on 05 February that the Kremlin is ready to work with the EU on implementing the Iran nuclear deal, officially known as the JCPOA. ...

He pointed out that Russia and the EU will continue to work with the Europeans on the JCPOA. "We [Russia and the European Union] continue to work together to ensure the implementation of the JCPOA. We hope that this U.S. administration will be able to decide whether to return to this important international document. This agreement is a means to strengthen the non-proliferation regime and reduce regional tensions," Lavrov continued.

... On the other hand, Borrell also expressed Europe's readiness to work with Russia on international issues such as the JCPOA. ... Earlier on 02 February, Russian state media reported that Maria Zakharova also expressed Moscow's readiness to work with the US on salvaging the Iran nuclear deal. ... On 03 February, Russian Deputy Foreign Minister Sergei Ryabkov and Deputy Secretary General for Political Affairs of the European External Action Service Enrique Mora discussed the JCPOA in a meeting in Moscow.

Source: <https://www.tehrantimes.com/news/457805/Russia-eyes-close-cooperation-with-EU-on-JCPOA-Lavrov-says,05February2021>.

**NORTH KOREA**

**North Korea Using Cyber-Attacks to Update Nukes, Say UN Experts**

North Korea has modernised its nuclear weapons and ballistic missiles by flaunting UN sanctions, using cyberattacks to help finance its programmes and continuing to seek material and technology overseas for its arsenal, UN experts said.

The panel of experts monitoring sanctions on the Northeast Asian nation said in a report sent to Security Council members on 08 February that North Korea's total theft of virtual assets from 2019 to November 2020 is valued at approximately USD 316.4 million, according to one unidentified country. The

panel said its investigations found that North Korean-linked cyber actors continued to conduct operations in 2020 against financial institutions and virtual currency exchange houses to generate money to support its weapons of mass destruction

and ballistic missile programmes. In its weapons development, the experts said, Kim Jong Un's government has also produced fissile material an essential ingredient for producing nuclear weapons and maintained its nuclear facilities. "It displayed new short-range, medium-range, submarine-launched and intercontinental ballistic missile systems at military parades," they said.

and intercontinental ballistic missile systems at military parades," they said. "It announced preparation for testing and production of new ballistic missile warheads and, development of tactical nuclear weapons...and upgraded its ballistic missile infrastructure." The panel recommended that the Security Council impose sanctions on four North Korean men: Choe Song Chol, Im Song Sun, Pak Hwa Song, and Hwang Kil Su.

The Security Council has imposed increasingly tough sanctions on North Korea since its first test

**The panel of experts monitoring sanctions on the Northeast Asian nation said in a report sent to Security Council members on 08 February that North Korea's total theft of virtual assets from 2019 to November 2020 is valued at approximately USD 316.4 million, according to one unidentified country.**

**Kim Jong Un's government has also produced fissile material an essential ingredient for producing nuclear weapons and maintained its nuclear facilities. "It displayed new short-range, medium-range, submarine-launched and intercontinental ballistic missile systems at military parades," they said.**

explosion of a nuclear device in 2006. It has banned most of the country's exports and severely limited its imports, trying to pressure Pyongyang into abandoning its nuclear and ballistic missile programs. But the report's summary and some key findings and recommendations, obtained by The Associated Press, make clear that North Korea remains able to evade sanctions and develop its weapons and to illicitly import refined petroleum, access international banking channels and carry out malicious cyber activities.

North Korea's arsenal escalated to a major threat to the US following tests in 2017 that included a detonation of a purported thermonuclear warhead and flight tests demonstrating its ICBMs could reach deep in the American mainland. A year later, Kim initiated diplomacy with South Korea and then-U.S. President Trump that derailed in 2019 when the Americans rejected North Korea's demands for major sanctions relief in exchange for a piecemeal deal partially surrendering its nuclear weapons capabilities.

In the year 2020, North Korea's already battered economy decayed further amid the COVID-19 pandemic, which led Kim to close the country's borders. That severely limited the legal and illegal transfer of goods and movement of people, according to the experts. At a North Korean political conference, Kim sharply criticized his government's economic agencies for unspecified passiveness and self-protecting tendencies, the North's state media reported. His remarks follow a ruling party congress last month where he called for greater state control over the economy while also vowing to continue all-out efforts to boost his nuclear program, which North Korea sees as a deterrent to the U.S. and thus an assurance of the Kim dynasty's continued existence. With his diplomatic efforts stalemated, Kim must start all over again with President Joe Biden, who previously called him a "thug" and criticized

Trump for summit spectacles instead of significant nuclear reductions.

In August 2019, the U.N. panel said North Korean cyber experts illegally obtained proceeds estimated at up to \$2 billion to fund its weapons programmes. The panel said in the new report that it investigated malicious activities by the Reconnaissance General Bureau North Korea's primary intelligence agency, which is on the U.N. sanctions blacklist including the targeting of

virtual assets and virtual asset service providers, and attacks on defense companies.

North Korea continues to launder stolen cryptocurrencies especially through over-the-counter virtual asset brokers in China to acquire fiat currency which is government backed, like

the U.S. dollar, the experts said. The panel said it is investigating a September 2020 hack against a cryptocurrency exchange that resulted in approximately \$281 million worth of cryptocurrencies being stolen, and transactions on the blockchain indicating the \$281 million hack is related to a USD 23 million second hack in October 2020. "Preliminary analysis, based on the attack vectors and subsequent efforts to launder the illicit proceeds strongly suggests links to the DPRK," the experts said, using the initials of the country's official name, the Democratic People's Republic of Korea. According to one unnamed country, North Korea also continues to generate illegal revenue by exploiting freelance information technology platforms using the same methods it does to access the global financial system — false identification, use of virtual private network services, and establishing front companies in Hong Kong, the panel said.

*Source: <https://www.financialexpress.com/defence/north-korea-using-cyber-attacks-to-update-nukes-say-un-experts/2191020/>, 09 February 2021.*

**North Korea continues to launder stolen cryptocurrencies especially through over-the-counter virtual asset brokers in China to acquire fiat currency which is government backed, like the U.S. dollar, the experts said. The panel said it is investigating a September 2020 hack against a cryptocurrency exchange that resulted in approximately \$281 million worth of cryptocurrencies being stolen.**

**NUCLEAR SAFETY**

**ARMENIA**

**European Commission Calls Armenia to Shut Down Metsamor NPP**

The Metsamor Nuclear Power Plant, which does not meet internationally accepted nuclear safety standards requires an early closure and safe decommissioning, says the European Commission's report titled "Partnership Implementation Report on Armenia".

The European Commission urges Armenia to adopt a road map or action plan to address this issue. "The nuclear power plant located in Metsamor cannot be upgraded to fully meet internationally accepted nuclear safety standards, and therefore requires an early closure and safe decommissioning. It is necessary to rapidly adopt a road map or action plan to address this, taking into consideration the need to ensure Armenia's energy security and conditions for sustainable development. The peer review of national action plan implementation held in November 2019 recognized that significant efforts have been made since 2016 and that there has been good progress on protecting the installations from external hazards", the report notes.

The Metsamor NPP is situated on an active seismic fault; the site of a devastating earthquake killed more than 50,000 people in 1988.

Armenia signed a Partnership and Cooperation Agreement (PCA) with the European Commission promising to shut down Metsamor by 2004. Nevertheless, the plant was in extremely poor condition that made its operation unsecure and

dangerous. The decision to restart the operation of the NPP led to the fears of another Chernobyl as it suffered from the same deficiencies in all early Soviet-designed reactors such as poor management, insufficient fire control, outdated computers, lax training, bad construction and not containment structure to prevent catastrophic release of radiation in the likely event of an accident.

In addition to its ageing technology, Metsamor, high in the mountains, lacks suitable water resources to use as reactor core coolant in the event that an earthquake damaged the facility, while Armenia's parlous fiscal situation means that its government lacks financial resources to address the consequences of a possible accident.

Metsamor is one less than a half dozen remaining nuclear reactors of its kind that were built without primary containment structures. In 2020, Armenian officials said that they planned to extend the operating lifetime of the Metsamor nuclear power plant until 2026 but it could continue to remain operational until 2036 after modernization.

*Source: [https://azertag.az/en/xeber/European\\_Commission\\_calls\\_Armenia\\_to\\_shut\\_down\\_Metsamor\\_NPP-1706147?\\_cf\\_chl\\_jschl\\_tk](https://azertag.az/en/xeber/European_Commission_calls_Armenia_to_shut_down_Metsamor_NPP-1706147?_cf_chl_jschl_tk), 06 February 2021.*

**The nuclear power plant located in Metsamor cannot be upgraded to fully meet internationally accepted nuclear safety standards, and therefore requires an early closure and safe decommissioning. It is necessary to rapidly adopt a road map or action plan to address this, taking into consideration the need to ensure Armenia's energy security and conditions for sustainable development.**

**Metsamor is one less than a half dozen remaining nuclear reactors of its kind that were built without primary containment structures. In 2020, Armenian officials said that they planned to extend the operating lifetime of the Metsamor nuclear power plant until 2026 but it could continue to remain operational until 2036 after modernization.**

**GENERAL**

**INSTN to Support the IAEA in Training the Next Generation in Nuclear**

Hundreds of students and professionals from around the world will receive education and training in various nuclear fields thanks to an agreement the IAEA and France's School for Energy and Health Technology (INSTN) signed. The training programs, including both in-person and online learning sessions, will take place over

the next four years. "INSTN is a well-recognized institution which has assisted the IAEA by providing comprehensive academic education and hands-on training to professionals in nuclear medicine, radiopharmaceutical production and industrial radiation applications, especially in countries across Africa" said Sasha Damjanac, Head of the IAEA Research Contracts Administration Section.

Based on the new agreement the two organizations signed on 3 February, INSTN, which is part of the French Alternative Energies and Atomic Energy Commission (CEA), will extend the support to the IAEA and its Member States to nuclear energy and nuclear safety and security. Specific areas of collaboration will include: nuclear knowledge management; nuclear energy management for nuclear applications; capacity building based on nuclear power plant simulators and research reactors; advanced nuclear energy systems; response to nuclear security events involving Material Out of Regulatory Control (MORC).

INSTN will also fund fellowships for female students, which will cover up to two years of graduate education in nuclear science and technology at INSTN. "Our new designation and the associated work plans will allow the IAEA and its Member States to benefit from INSTN's and CEA's expertise to build the skills of the current and future nuclear workforce. We will now be able to share our know-how in areas such as knowledge management, digital transformation of education and training, heritage conservation, and response to nuclear security events," said Eric Gadet, INSTN's Director. Collaborating Centres work with the IAEA in specific technical areas, sharing knowledge and resources in the peaceful uses of nuclear technology. Of the 46 Collaborating Centres offering research, development and training, most work with the IAEA in a single thematic area, while a few engage in two areas of work. INSTN is the second Collaborating Centre after Russia's ROSATOM to support the IAEA's activities in three programmatic areas.

**INSTN is a well-recognized institution which has assisted the IAEA by providing comprehensive academic education and hands-on training to professionals in nuclear medicine, radiopharmaceutical production and industrial radiation applications, especially in countries across Africa.**

*Source: Aleksandra Peeva, <https://www.iaea.org/newscenter/news/instn-to-support-the-iaea-in-training-the-next-generation-in-nuclear>, 05 February 2021.*

### **New Drone Technology for Radiological Monitoring in Emergency Situations**

In the aftermath of a nuclear accident, such as the one at Fukushima Daiichi Nuclear Power Plant in 2011, the radiologically contaminated area in the vicinity of a reactor can be too dangerous for people to enter to monitor radiation. A new technology using drones, developed by the IAEA for use by the authorities of Fukushima Prefecture in Japan, will make this task easier.

An IAEA-developed instrumentation and methodology for UAVs equipped with radiation detectors, cameras and GPS devices has been tested and validated under real conditions in the Fukushima Prefecture in Japan and is now available for practical use in routine or emergency situations. Based on this experience, the IAEA is ready to assist interested Member States to develop and implement this technology for radiological mapping following a nuclear or radiological emergency. The low cost of drones and the fact that people avoid being exposed to radiation by using them

are significant advantages of this technology. The IAEA and Fukushima Prefecture first started working together on developing and applying UAVs for radiological monitoring in 2012. In the framework of the IAEA Action Plan on Nuclear Safety, the IAEA has assisted Fukushima Prefecture through two consecutive cooperation projects from 2012 to 2020 by:

- Providing a complete UAV-based instrumentation system for radiation measurements — a radiation detection system with data processing and storage capability — developed and built at the IAEA Nuclear Science and Instrumentation Laboratory (NSIL);
- Providing post-measurement analysis and interpretation methodology as well as training



personnel both at Fukushima Prefecture and at NSIL in Seibersdorf, Austria on how to apply the UAV and its instrumentation system as well as on how to use the software for obtaining and interpreting data.

Recently there has been breakthrough advances in UAVs and major developments are expected in the near future, including larger payloads, integrated detectors and sensors, improved self-navigation and the ability for the vehicles to work in cooperation with other UAVs as well as ground systems. The IAEA is currently working on the integration and testing of new, improved instrumentation, including its adaptation to the next generation of UAVs.

"These novel developments will allow both longer flight time of the UAV and determination of the dose equivalent rates and gamma spectra in a single measurement," said Danas Ridikas, Head of the IAEA Physics Section. "When combined with high quality camera capabilities, the new system will allow obtaining a full 3D aerial photogrammetry model superimposed with the radiological maps and radionuclide identification."

UAV-based technologies will be crucial for advancing radiation monitoring, including enhancing the application of environmental mapping and improving long-term monitoring of contaminated areas, explained Miroslav Pinak, Head of the IAEA Radiation Safety and Monitoring Section. The data collected using the UAV systems developed by the IAEA and validated by Fukushima Prefecture can be used to assess potential radiation risks and help establish appropriate remediation, decontamination and nuclear waste management plans and strategies in Japan. A detailed IAEA technical document of the project

results, including instrumentation calibration, methodology validation, in-situ dose rate measurements and mapping of the radioactive waste temporary storage sites in Fukushima

Prefecture will be made available publicly. The developed technology, methodology and training opportunities are available to IAEA Member States upon request and are already being implemented in some countries with the Agency's support.

**How does the Technology Work?** The UAVs are equipped with radiation detectors, cameras and GPS

devices. After the UAV takes off, radiation readings and other relevant information are synchronized with exact GPS position and sent in real time to the pilot at the ground station and stored onboard. After landing, all detailed data is recovered, which means that the photographic/geographic information is reconstructed together with the corrected data of the radiation measurements. The satellite-like photographs and the analysed radiation data measurements are then made available to decision-makers for further action.

*Source: Aleksandra Peeva,*

*<https://www.iaea.org/newscenter/news/new-available-new-drone-technology-for-radiological-monitoring-in-emergency-situations>, 01 February 2021.*

**The IAEA is currently working on the integration and testing of new, improved instrumentation, including its adaptation to the next generation of UAVs. "These novel developments will allow both longer flight time of the UAV and determination of the dose equivalent rates and gamma spectra in a single measurement," said Danas Ridikas, Head of the IAEA Physics Section.**

**A global stockpile of around 250,000 tonnes of highly radioactive spent fuel are stored across some 14 countries for disposal. The volume is likely to increase soon as many reactors, especially in Europe, due to be decommissioned by 2025.**

## **NUCLEAR WASTE MANAGEMENT**

### **RUSSIA**

Undeniably, nuclear is an abundant source of energy with potential to address energy security concerns of the entire humanity for a prolonged period of time; but serious attention is required for the eventual elimination of nuclear waste that are piling up in temporary storages. A global stockpile of around 250,000 tonnes of highly radioactive spent fuel are stored across some 14

countries for disposal. The volume is likely to increase soon as many reactors, especially in Europe, due to be decommissioned by 2025. The idea of geological repositories for long-term burial of nuclear waste, though sounds technically feasible, has been a matter of intense public opposition. A prudent alternative, therefore, is to recycle fuel-worthy material that remains in the 'spent fuel'.

The 'spent fuel' now seems mistakenly called 'nuclear waste' and considered a national burden in public opinion; when in fact, they can be a national asset and an additional source of energy through reprocessing and advanced reactor technology. A handful of countries including India and Russia have adopted the method of 'reprocess to reuse' of spent fuel in 'closed fuel cycle' based on innovative fuel refabrication and 'fast' reactors.

Mainly three concerns are highlighted regarding the spent fuel or nuclear waste: 1) increase the volume of waste; 2) long-term radioactivity in high-level waste; and 3) threat of plutonium being diverted. Reprocessing or recycling of the spent fuel can potentially address all these concerns amicably. The method currently used for reprocess is called PUREX (plutonium-uranium extraction) to recover fissile and fertile materials to provide fresh fuel for nuclear power plants. This helps to "recover unused plutonium, along with unused uranium thereby closing the fuel cycle, gaining some 25-30% more energy from the original uranium".

Many opine that there are real advantages of reprocessing of spent fuel: the amount of material that required for a specific amount of electrical production is reduced by a factor of 10; the cooling-off time of remaining waste material is reduced to around 400 years which otherwise would last many thousand years; and the volume of final waste is also reduced by roughly a factor of 10. Therefore, the final waste generated can be managed relatively easily through the 'vitrification' method. The closed fuel cycle also reduces the chances of proliferation or

misappropriation of radioactive material.

According to IAEA Nuclear Technology Review 2020, "around 400,000 tonnes of heavy metal have been discharged...as spent nuclear fuel, of which about 30% has been reprocessed. The rest is stored either in reactor pools or in the 151 away-from-reactor spent fuel storage facilities in 27 countries." Only France, Russia, Japan, UK, and India are reprocessing with combined civil capability of 3860 tonnes of spent fuel per year. The ultimate aim is to eliminate the so-called 'nuclear waste' from nuclear power generation. If permanent repository is a pipe dream and temporary storages are risk-prone, reprocessing

of spent fuel seems to be a silver lining that the all nuclear-capable countries must readily embark on.

Russia has achieved phenomenal progress in this domain and likely to attain full industrial scale during 2030-40. It is the only country in the world where industrial "fast"

neutron reactors are now operating with depleted uranium. As part of the Proryv (Breakthrough) project, Russia has planned to separate minor actinides (neptunium and americium) from radioactive waste and include them in the fuel matrix. The Breakthrough project comprises a fuel fabrication/refabrication module for production of dense nitride fuel for fast reactors; a nuclear power plant with a BREST reactor; and a used fuel retreatment module. After the necessary amendment to domestic legal framework in 2001, Russia has also imported depleted uranium hexafluoride from Germany which in fact are not nuclear waste, but a promising nuclear raw material and source of profit. The depleted uranium is both a potential source of uranium-235, and a source of nuclear fuel for fast reactors, which will be used in closed fuel cycle.

Moreover, Russia does not face any acute problem of storage of uranium hexafluoride. Commissioning of the RBMK-1000 "dry" spent nuclear fuel (SNF) storage facility in December 2015 has solved the problem of overfilling of on-site SNF storages, beside solving the problem of

**According to IAEA Nuclear Technology Review 2020, "around 400,000 tonnes of heavy metal have been discharged...as spent nuclear fuel, of which about 30% has been reprocessed. The rest is stored either in reactor pools or in the 151 away-from-reactor spent fuel storage facilities in 27 countries.**

unscheduled shutdown of about 50% of the electrical capacity of Russian NPPs. Russia has approximately 22,449 metric tons of spent fuel (2016), much of it stored in temporary cooling pools. Meanwhile, it generates around 700 tonnes of spent fuel from its nuclear power plants, research reactors, and submarines every year. In its effort to eliminate nuclear waste its perspective plan for reprocessing of domestic and imported spent fuel seems promising. According to data from the predecessor of Rosatom, the Russian Ministry of Atomic Energy (Minatom), Russia could earn up to US\$20-21 billion out of the reprocessing business in the long-run. This earning in turn will support reprocessing of domestic spent fuel, solve environmental problems, meet future nuclear fuel demand, and reduce proliferation risks.

Currently, Russia has two reprocessing facilities: RT-1 plant (at Mayak) in Chelyabinsk, and RT-2 in Zheleznogorsk which is under construction. With its completion, Russia's reprocessing capacity would increase to 1,940 tonnes per year. With modernization and improvement in efficiency, the

RT-1 facility is planned to function as a universal plant capable of processing all types of spent fuel. Previously, the plant handled used-fuel from VVER-440 reactors, submarines, fast and research reactors.

Along with the advancement in nuclear reactor technology, global nuclear discourse is now hinting at a profitable reprocessing market, and Russia should capitalize on this opportunity expeditiously. Given its global dominance in reactor technology and nuclear fuel supply, it can spearhead to create big market for its fourth-generation reactors integrated with closed fuel cycles technology. The recent allocation of 64 billion rubles (almost US\$1 billion) for the development of energy components including technologies for closed fuel cycle based on fast reactors is one of the key forward looking tasks for Russian nuclear industry for the period up to 2024.

*Source: Article by Sitakanta Mishra, <http://www.businessworld.in/article/-Reprocess-To-Reuse-Nuclear-Waste-Is-The-Way-Forward/14-02-2021-377401/>, 14 February 2021.*

**Russia has approximately 22,449 metric tons of spent fuel (2016), much of it stored in temporary cooling pools. Meanwhile, it generates around 700 tonnes of spent fuel from its nuclear power plants, research reactors, and submarines every year. In its effort to eliminate nuclear waste its perspective plan for reprocessing of domestic and imported spent fuel seems promising.**



Centre for Air Power Studies

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

Centre for Air Power Studies

P-284

Arjan Path, Subroto Park,  
New Delhi - 110010

Tel.: +91 - 11 - 25699131/32

Fax: +91 - 11 - 25682533

Email: [capsnetdroff@gmail.com](mailto:capsnetdroff@gmail.com)

Website: [www.capsindia.org](http://www.capsindia.org)

**Edited by: Director General, CAPS**

**Editorial Team: Dr. Sitakanta Mishra, Dr. Hina Pandey, Dr. Poonam Mann, Zoya Akhter, Nasima Khatoon, Sanjana Gogna**

**Composed by: CAPS**

Disclaimer: Information and data included in this newsletter is for educational non-commercial purposes only and has been carefully adapted, excerpted or edited from sources deemed reliable and accurate at the time of preparation. The Centre does not accept any liability for error therein. All copyrighted material belongs to respective owners and is provided only for purposes of wider dissemination.