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OPINION – Sergio Duarte

Modernization, New Weapons and the Risks to International Security

Along the decades following the advent of nuclear weapons, several bilateral and multilateral agreements in the field of arms control were concluded, all with the declared objective of increasing international security. Chief among those is the 1970 NPT which recognized five countries as possessors of such weapons. Later, four other nations that are not party to the NPT acquired atomic military capability. Although important for limiting the dissemination of nuclear arms to an even larger number of countries, the NPT did not establish hindrances to the growth and technological improvement of existing nuclear arsenals. All states that had acquired those weapons, in particular the two larger powers—Russia and the US—went on to increase the size and the might of their armament. The number of nuclear weapons in the world at the height of the Cold War reached the staggering figure of 70000, 95% of which in the hands of those two nations.

Bilateral Instruments:

Starting from the 1980's the US and the former Soviet Union sought to cooperate to reduce their nuclear arsenals. In 1987 a treaty between both countries known as the INF entered into force, by which

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they agreed to prohibit the deployment, production and testing of intermediate range ballistic and cruise missiles. However, after mutual accusations of non-compliance, the US announced in 2019 the suspension of its obligations under it and were immediately

followed by Russia. Washington proposed to include China in a future trilateral arrangement of limitations, but Beijing maintains its opposition to this initiative arguing that there is a great disparity in the size of its nuclear forces and those of the two other states. Thus, the production, testing and

deployment of missiles of the kind described in the INF are not subject to any quantitative or

qualitative restrictions.

In the beginning of the current century, developments such as the obsolescence of the armament and the cost of its maintenance, together with the lessening of tensions between the two largest nuclear powers contributed to the celebration of a historic agreement between Washington and Moscow to limit and reduce the number of strategic warheads and vectors that each one could possess. Known as New START, this agreement was concluded in 2009. Drastic reductions resulted in the destruction, dismantlement or retirement of a large number of nuclear weapons in both countries. Although there is no independent verification system, it is believed that the total number of such weapons in the two nations is at present around 14000. Atomic armaments in the other nuclear armed countries are estimated at 320 for China, 290 for France, 215 for the UK, 160 for India, 160 for Pakistan, 90 for Israel and 40 for DPRK.

Upon announcing the decision of his administration to negotiate the New START agreement with Russia, President Obama stated the intention of his country to “seek the security of a world without nuclear weapons”. However, in order to ratify the agreement, the American Senate demanded a significant increase in the financial resources aimed at enlarging and intensifying the ongoing programs of modernization of the existing nuclear arsenal. For its part, Russia continued the implementation of programs for the improvement of its own arms while some of the other nuclear states kept adding new weapons to their stocks. The upsurge of the climate of hostility, mistrust

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and competition among nuclear-armed states in the second half of the 2010-2020 decade almost caused the collapse of New START, which was ultimately extended for five years a few days before the deadline for its expiration in February 2021. The limits agreed in 2009 were maintained and new reductions are expected in the future, an outcome that still seems remote. Such limits, however, apply only to strategic weapons. None of the existing international instruments in the field of arms control actually prevent “modernization”, a euphemism under which, despite the agreed quantitative reductions, the main powers engage in the refinement of the destructive power of their weapons, both nuclear and conventional. They also work to extend the life and reliability of the warheads without resorting to explosive tests. To justify this posture, each side points to the need to counter the efforts of their rivals.

New Technologies: Based on such arguments, the armed nations have intensified in the last few years the development and application of new war-fighting technologies, especially those aimed at the improvement, testing and production of vectors able to carry both nuclear and conventional payloads. These technologies encompass hypersonic missiles, attack systems by nuclear propulsion and unmanned vehicles (drones). They also made possible, among other advancements, qualitative progress in the speed and precision of the weapons, miniaturization of components and remote sensing. Hypersonic missiles operate at speeds above Mach 5. Their velocity and evasive capacity make defense by existing systems almost impossible. According to specialized publications, the Defense Advanced

Research Projects Agency (DARPA) of the US is developing a hypersonic missile and may very soon be able to deploy it.

Another possibility is a “long range strategic cannon” that can fire projectiles at speeds several times that of the sound. Russia, for its part, has been conducting operational tests of the hypersonic missile systems *Avangard*, *Tsirkon* and *Kinzhal*, based on land, sea and air, while China is experimenting with the *Xingkong* missile. These systems are able to operate with nuclear and conventional payloads. Hypersonic vehicles armed with conventional explosives and using high precision guidance systems may, for instance, destroy or disable in a short span important elements of the military infrastructure of the enemy and prevent, by virtue of their speed, the timely setting off of the anti-missile systems.

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Although an attack of this kind with conventional charges would probably not have a direct impact on land based strategic forces protected by reinforced underground silos, it would leave to the adversary the onus of deciding whether to respond with its nuclear forces and most certainly would provoke retaliation in kind. The possibility of quick escalation toward an all-out nuclear exchange shows the risks involved in the use of resources such as those. According to officials from the department of Defense, the US are at a disadvantage in this field and need to step up the efforts to produce a new cruise missile to be launched from submarines, in response to the development of the Russian system *Poseidon*, which is already undergoing operational tests in Arctic waters.

Russia is also completing the development of the *Burevstnik* system, a nuclear-powered cruise missile with a practically unlimited range and unpredictable trajectory. When mentioning the plans for the production of this new weapon, President Putin deemed it “invincible” against existing defensive systems.

The *Poseidon* is a torpedo, or unmanned submarine drone, with a high stealth capability and armed with conventional or very powerful nuclear warheads. Powered by a mini nuclear reactor, it can operate at a depth of 1000 meters with speed up to 100 knots. Russia is also completing the development of the *Burevstnik* system, a nuclear-powered cruise missile with a practically unlimited range and unpredictable trajectory. When mentioning the plans for the production of this new weapon, President Putin deemed it “invincible”

against existing defensive systems. However, American specialists have been sceptical about the operational worth of these new Russian weapons.

Cutting edge technologies of unmanned systems, both aerial and submarine, have allowed countries with different degrees of

advancement to develop vehicles capable of transporting nuclear or conventional weapons with greater autonomy. Aerial vehicles of this kind, or drones, have been used in conventional conflicts in Syria, Iraq, Libya and Nagorno-Karabakh, to mention only a few. It is not known whether they

have been used in tests to carry nuclear or launch nuclear weapons. According to some commentators, the US is interested in an unmanned version of the new strategic bomber B-21, which should enter into service in the middle of the current decade. Drones could also be used to disseminate

biological or chemical agents over enemy territory. Usually, such vehicles travel at a lower speed and altitude than cruise missiles and carry lighter payloads, but new versions with features similar to those of missiles are said to be under development. Their main advantage is not to rely on human operators on board, thus reducing casualties among the attackers.

An emerging technology currently in the stage of research and development by the US, Russia and China is the use of artificial intelligence to allow drones to coordinate their action in extended missions by using “swarms”, with effects potentially similar to that of weapons of mass destruction. At the current stage of technology, it is not considered possible in the foreseeable future to program drones to distinguish between combatants and civilians. This has raised concern in several quarters, particularly in humanitarian non-governmental organizations which advocate the complete prohibition of fully autonomous lethal systems.

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At the same time, there are ample opportunities for the commercial use of drones in a huge variety of civilian jobs as their range payload and speed increase, ensuring their continuing technological development alongside their military uses. The increase in the effectiveness of unmanned aerial vehicles is expected to bring advances in remote sensing technology by means of electromagnetic spectrum associated with the already frequent use of photographic reconnaissance and submarine acoustics in order to maximize resolution and penetrate different forms of camouflage.

The possibilities offered by the future development of systems that utilize the special properties of certain physical entities, or *quanta*, are also worth mentioning. Quantic computers are able to solve certain problems faster and with greater precision than traditional computers; quantic sensors are more reliable and accurate than GPS’s and communication with quantic keys is safer than current digital systems, adding attractiveness to the weapons that relies on them.

Other areas of research such as nanotechnology and the weaponization of outer space, including the use of offensive satellites as well as cybernetics must also be recalled. Offensive applications of cyber technology threaten to disable internal communication structures that

are necessary for the smooth functioning of a vast array of national and international communications, banking, health and transportation networks, among others. There are also fledgling technologies of “additive manufacture”, that is, the production of objects with the use of a device similar to current printers through the addition of layer upon layer of materials, according to a computer-generated model. Press accounts inform that American companies, such as Raytheon, have been able to produce missiles using this method and that others had similar success in creating spare parts and other components of missiles.

However, it would be harder for non-state actors to obtain weapon of mass destruction from computer program since some materials simply are not available for or amenable to 3D printing. It would thus be impossible to produce a complete nuclear, chemical or bacteriological weapon by plugging a computer to a printer, although such a procedure could be feasible with regard to some components.

Conclusion: The current process of erosion of the main arms control instruments, both multilateral and bilateral and the apparent inability to establish a constructive dialogue aimed at disarmament, together with the ongoing qualitative and quantitative expansion of arsenals and of research and development laboratories and other facilities, has lowered the normative and practical barriers against the proliferation of weapons of mass destruction.

At the same time, the increase in rivalry and mistrust among the armed countries spurred the competition for military applications of new technologies such as those described above. On the other hand, the emergence of state actors able to defy the military pre-eminence of the main powers has led others to explore more attentively their own possibilities and to examine—albeit timidly—alternatives to the dependence on

American might to enhance their security. This sparked fears of emergence of new nuclear-capable states. It must also be taken into account that technological advancements, many of which are no longer exclusive to the most armed countries, are blurring the distinction between nuclear and conventional operations, while emerging technologies become more accessible. All those factors increase the risks of potential escalation toward the use of nuclear weapons in a future conflict.

In order to ensure the permanence and credibility of international arrangements aimed at maintaining stability and to allow for their evolution into formulations able to offer greater security to all members of the international community it will be necessary to stimulate dialogue and multilateral cooperation centered on the elimination of nuclear weapons. This must be done with a view to negotiating and adopting instruments to regulate the military use of cutting-edge technologies. At the same time, new paradigms of peaceful coexistence among nations must be devised and developed. The constant effort of the five countries anointed by the NPT to seek to legitimize and perpetuate their exclusive standing as “nuclear states” intensifies the underlying danger of trivializing and accepting the current world nuclear status.

To a certain extent this has also been the case with the nuclear countries not recognized by the NPT, such as India, Pakistan Israel and North Korea. India enjoys the support of several counties for its inclusion in the NSG, a condition also claimed by Pakistan. Few voices in the West question or criticize the possession of nuclear weapons by Israel. Moreover, some sectors of

opinion in the United States do not seem as adamantly opposed as before to the prospect that

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North Korea keeps its place as a second-rate nuclear power as long as stabilization agreements in Northeast Asia can be adopted. As for Iran, at the time of the preparation of this article there were some indications that the JPCOA could be revived as an instrument of restraint of the nuclear program of the Islamic Republic, but developments in the last few days seem to point to further difficulties. It is however too soon for a realistic assessment. On this issue, it is useful to recall the explicit posture of Saudi Arabia with regard to the possibility of acquisition of nuclear weapons by Iran as well as the vehement condemnation by Turkey of the discriminatory regime imposed by the NPT, albeit implicitly and until now without a concrete consequence.

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The panorama of risks and uncertainties in the field of international security sketched above unfolds at a time when the Covid-19 pandemic impact is being felt on many aspects of the life and interaction among nations with a strength and magnitude hitherto unknown in recent history. Among its most negative consequences are the exacerbation of the trend to egocentrism and self-absorption on the part of those that enjoy better conditions and their reluctance to share scientific and financial resources with the remainder of the international community.

Just as the means to ensure security, the most powerful seek to appropriate the means that they believe can afford them protection from the virus. This protection, however, is illusory and will be short-lived if sought by way of excluding others. It is well known that in order to be effective measures such as vaccination must encompass

the whole or the largest portion of the population in the shortest delay possible. For this reason, and in spite of contrary political trends, evidence shows that effective control of the global health emergency to the benefit of the international community as a whole requires more coordinated management of the pandemic and more cooperative use of the world scientific and technical capabilities.

By the same token, the insecurity and instability fuelled by the unbridled search of new means of destruction must be countered by greater cooperation among nations for the adoption of effective disarmament

instruments and the strengthening of collective security. The ceaseless development of new, more powerful, faster and more lethal weapons does not ensure security. Weapons that seem to bring military superiority will be constantly neutralized by rivals, in a stubborn competition in which there cannot be winners—and the losers will not be only those involved in the conflict, but the whole of humankind.

Source: <https://www.indepthnews.net/index.php/opinion/4377-modernization-new-weapons-and-the-risks-to-international-security>, 16 April 2021.

OPINION – William D. Hartung

Biden can Make History on Nuclear Arms Reductions

“As a nuclear power, as the only nuclear power to have used a nuclear weapon, the United States has a moral responsibility to act. We cannot succeed in this endeavour alone, but we can lead it, we can start it. So today, I state clearly and with conviction America’s commitment to seek the peace and security of a world without nuclear weapons.” The speech was widely praised and

was the principal reason Obama was awarded the Nobel Peace Prize later that year. But talking about eliminating nuclear weapons and getting the job done are two very different things. To be fair, Obama didn’t claim it would be easy, saying “this goal will not be reached quickly -- perhaps not in my lifetime.”

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President Obama did have two signature achievements on nuclear weapons policy — the conclusion of the New START nuclear reductions treaty with Russia and the multilateral deal to curb Iran’s nuclear program, known formally as the JCPOA.

preserved and expanded a rigorous verification regime that injects a measure of predictability in nuclear relations between Washington and Moscow. The Iran deal headed off a potential war

President Obama did have two signature achievements on nuclear weapons policy — the conclusion of the New START nuclear reductions treaty with Russia and the multilateral deal to curb Iran’s nuclear program, known formally as the JCPOA. New START cut deployed U.S. and Russian warheads by one-third and

between Washington and Tehran and put enforceable limits on Iran’s ability to develop a nuclear weapon. Both were significant accomplishments that made the world a safer place.

But domestic and international politics and a lack of sustained attention to the issue conspired to make New START the last step towards nuclear disarmament of the Obama era. There was no follow-on agreement to New START, and no effort to rethink the massive nuclear modernization plans being pursued by the Pentagon and the Department of Energy, which were actually reaffirmed and expanded by the Obama administration as part of the price of winning Republican support for Senate ratification of New START.

Meanwhile, President Trump did everything in his power to erase the Obama nuclear legacy and attack arms control more generally, abandoning the Iran deal, withdrawing from a longstanding

agreement on intermediate-range nuclear weapons in Europe and adding new warheads and weapons systems to the Pentagon's already massive, three-decade-long nuclear modernization plan, which could cost up to \$2 trillion.

As a candidate and now as President, Joe Biden has embraced the Obama legacy by renewing the New START treaty with Russia and promising to re-join the Iran nuclear deal. Time is of the essence on the Iran deal. The administration must seize on recent, promising signs of progress to re-enter the deal as quickly as possible, before domestic politics in the U.S. and Iran make it much more difficult to do so. On the broader nuclear front, Biden has pledged to "head off costly arms races and re-establish our credibility as a leader in arms control." Rescuing the best aspects of Obama's nuclear policies is a worthy undertaking, but President Biden can and must go further. A good place to start would be by revisiting the Pentagon's costly and unnecessary nuclear weapons modernization plan. As part of that effort, he should cancel the plan to spend \$264 billion to develop, build and operate a new ICBM.

Cancelling the new ICBM would be good politics as well as good policy. A poll carried out by *ReThink Media* on behalf of the Federation of American Scientists found that 60 percent of Americans favoured either forgoing the development of a new ICBM, eliminating ICBMs or eliminating all nuclear weapons.

As former Secretary of Defense William Perry has noted, ICBMs are "some of the most dangerous weapons in the world" because the President would have just a matter of minutes to decide whether to launch them in a crisis, greatly increasing the risk of an accidental nuclear war based on a false alarm. Bearing this in mind, Sen. Ed Markey (D-Mass.) and Rep. Ro Khanna (D-Calif.) are co-sponsoring a bill – the "Investing in Cures Before Missiles (ICBM) Act" – that would take funds

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slated for the new ICBM and invest them instead in efforts to develop a universal coronavirus vaccine. The arguments against ICBMs are underscored in a blueprint for a "deterrence-only" nuclear strategy developed by the organization Global Zero, which persuasively makes the case for a revamped nuclear arsenal that eliminates ICBMs and relies on smaller numbers of nuclear-armed submarines than are currently deployed, along with a reserve force of nuclear-armed bombers.

Adopting this approach would have a stabilizing effect and could set the stage for further measures aimed at achieving the ultimate goal of eliminating nuclear weapons altogether, as required under the UN Treaty on the Prohibition of Nuclear Weapons, which entered into force in January 2021 after it was ratified by 54 nations, but none of the major nuclear powers, yet. Cancelling the new ICBM project would be a good place to start towards the goal of creating the nuclear-free world that Barack Obama endorsed and Joe Biden could help advance.

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Source: <https://thehill.com/opinion/national-security/548507-biden-can-make-history-on-nuclear-arms-reductions>, 15 April 2021.

OPINION— Ken Dilanian, Carol E. Lee, Dan De L

North Korea has More Nuclear Weapons than Ever. What should Biden Do?

Ever since North Korea began building nuclear weapons in the 1990s, the policy of the US has been clear: Give up those bombs or face international isolation. After three decades of sanctions, threats of force and diplomacy — including President Trump’s theatrical summits with North Korean leader Kim Jong Un — North Korea now has more nuclear weapons than ever, plus ballistic missiles that intelligence officials say could deliver a warhead to the U.S. And because of the global pandemic, the hermit kingdom has shuttered its borders, halting imports of food and medicine in a way more punishing than international sanctions could ever be. That dangerous security threat is now in President Joe Biden’s lap, and his administration is expected to announce the results of a policy review on North Korea soon.

Experts and people briefed on it say they expect that while Biden will not formally abandon the goal of “total denuclearization,” he will attempt to achieve the more limited aim of diminishing North Korea’s nuclear threat, while at the same time seeking to lower the visibility of a thorny foreign policy problem that has no neat solution. “Realistically speaking, the administration’s North Korea strategy will probably be open to (an) approach in which North Korea’s capabilities are capped or limited,” Eric Brewer, who worked on North Korea policy at the National Security Council in the Obama administration, told NBC News. “Even if denuclearization remains a component of the strategy, I find it hard to believe they wouldn’t be open to more interim solutions that reduce the threat.” The administration also plans

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to seek to reinvigorate the so-called trilateral relationship between the U.S., South Korea and Japan, according to a former Trump administration official who has been consulted. Whether there are direct talks with the North Koreans depends on the North’s behaviour, that person said.

While denuclearization would remain a long-term goal, the U.S. could try to persuade North Korea to agree to restrictions on its delivery systems for nuclear weapons in return for substantial relief from economic sanctions, Brewer said. If unchecked, those delivery systems, including solid-fuel missiles, ICBM warheads and multiple re-entry vehicles, could allow North Korea to launch attacks faster and potentially evade U.S. countermeasures. Brewer recently co-authored an article in *Foreign Affairs* with Sue Mi-Terry, who

worked on the National Intelligence Council under President Obama and served as a CIA analyst, arguing for a “realistic bargain” with North Korea. The two, who are both now senior fellows at the Center for Strategic and International Studies, wrote that the fallout from the Covid-19 pandemic has exacerbated the regime’s economic woes, and could mean North Korean leader Kim Jong Un would be open to cutting a deal. “Kim has not been easily swayed by economic pressure in the past,” they wrote, but it is possible he is desperate enough for sanctions relief — and confident enough in his existing nuclear and missile capabilities — that he would trade some limits on his weapons programs for a significant reduction in sanctions.”

In an interview, Terry told NBC News, “Right now, we are looking to re-engage with North Korea in some form.” Victor Cha, who oversaw Korea policy in the George W. Bush administration, agreed. He noted that North Korea has shut down its borders completely in an effort to tamp down the spread of Covid-19, including imports of food and medicine from China. In so doing, it has imposed a blockade on itself more draconian than sanctions, which don’t usually cover humanitarian aid. “This is about as maximum as the sanctions can be and it’s all

self-imposed," said Cha, who said Biden may want to offer pandemic-related aid as a gesture of goodwill. Even with a less ambitious objective, arms control negotiations with North Korea would be "really, really hard," Brewer said, particularly because Pyongyang has tended to fiercely resist any inspection or verification mechanisms. And any restrictions on the North's weapons systems would have to be verified on the ground, he said, not just via U.S. intelligence surveillance.

Intelligence officials say North Korea has no intention of giving up its nuclear weapons, leaving the Biden administration faced with a series of unpalatable options. They range from attempting to restart talks that have a history of failure to a military strike that could have disastrous repercussions. "North Korea will be a WMD threat for the foreseeable future, because [Kim Jong Un] remains strongly committed to the country's nuclear weapons, the country is actively engaged in ballistic missile research and development, and Pyongyang's (chemical and biological) efforts persist," says an unclassified intelligence assessment released on 13 April, 2021 by the Office of the Director of National Intelligence. After two failed presidential summits with Trump, North Korea has greeted the incoming Biden team with a series of provocations, including harsh rhetoric and a short-range missile test. But so far, the regime has not taken the far more provocative steps of testing a long-range missile or a nuclear weapon, both of which it has done previously.

There is always a chance, however, that Biden's bid for negotiations fails, and North Korea falls back on its pattern of aggressive and attention-seeking behaviour, including threatening its neighbours and testing dangerous weapons. If that happens, the only real option short of war — covert CIA operations aside — is more economic sanctions, experts say. Critics point out that years of sanctions of various kinds have failed to convince the North to denuclearize. But in fact, observers say, the U.S. has never mounted the sort of sustained and biting sanctions campaign

against North Korea that the Obama administration used to push Iran to bargain, resulting in a 2015 nuclear agreement from which Trump withdrew, but which Biden is seeking to restore. "It took three years of really hard sanctions for Iran to come to the negotiating table," Terry said. Those sanctions included penalties against European and other banks accused of violating the law by doing business with Iran. So far, no administration has been willing to levy similar "secondary sanctions" against Chinese banks that keep North Korea afloat.

"The U.S. imposed \$8 billion to \$9 billion in fines on U.K. and French banks for money laundering for Iran, but \$0 in fines on Chinese banks for money laundering for North Korea," said Bruce Klingner, a former CIA analyst and Korea expert at the Heritage Foundation. Klingner and other North Korea experts cite a single telling exception to that rule: An action against an obscure bank in Macau that they say could be a blueprint for putting the squeeze on North Korea.

The Treasury Department imposed sanctions on Banco Delta Asia in 2005, accusing it of laundering money for the North Korean regime. Soon, more than two dozen financial institutions had pulled back from doing business with North Korea, imperilling its finances. Even many top U.S. officials were surprised at how hard the sanctions had bitten.

"You Americans finally have found a way to hurt us," Cha, then the point person on Korea policy, recalls an inebriated North Korean diplomat mumbling during a round of toasts at a negotiation. But two years after the sanctions on the bank were imposed — including the freezing of \$25 million in North Korean assets — the U.S. gave the money back, paving the way for North Korea to re-enter the international banking system. It was part of a deal that was supposed to result in the unwinding of North Korea's nuclear weapons program. That didn't happen, of course, yet no similar sanctions have been levied since.

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Joshua Stanton, who runs the blog One Free Korea and is one of the foremost experts on North Korea sanctions, argues that United Nations reports on sanctions compliance regularly provide evidence that could be used to penalize companies, but the U.S. has rarely acted on that material. "Why are we more tolerant of Chinese banks violating North Korea sanctions than Barack Obama was of European banks that violated Iran sanctions?" asked Stanton.

In order for diplomacy to work, it must be backed by a credible threat of force, the former Trump administration official and other experts say. "The only way to get the North to agree to anything is sanctions plus a military threat, and diplomatic pressure."

One reason, Cha and others say, is because the U.S. has long sought China's help in pressuring North Korea. "We've always been careful about going after Chinese," Cha said. "It's a balancing act — there's a desire to have Chinese cooperation in the negotiations."

In order for diplomacy to work, it must be backed by a credible threat of force, the former Trump administration official and other experts say. "The only way to get the North to agree to anything is sanctions plus a military threat, and diplomatic pressure" the former official said. In response to questions from NBC News, a spokesperson for the National Security Council said, "The North Korea review is in its final stages and we're not going to get ahead of that."

Source: <https://www.nbcnews.com/politics/national-security/north-korea-has-more-nuclear-weapons-ever-what-should-biden-n1263983>, 17 April 2021.

OPINION – David Vergun

U.S. Facing Increasing Nuclear, Space-Based Threats, Leaders Say

"For the first time in our history, the nation is facing two nuclear-capable strategic peer adversaries at the same time," Navy Adm. Charles

A. Richard, commander of U.S. Strategic Command said. Stratcom is responsible for maintaining the nation's nuclear triad, which consists of strategic bombers, submarines and intercontinental ballistic missiles. "Chinese and Russian advances are eroding our conventional deterrence," he said. Regarding China, they are rapidly expanding their strategic capabilities and are on pace to double their nuclear weapons stockpile by the end of the decade,

Richard said. The admiral mentioned that Chinese ICBMs can be mounted on trucks so their location can be concealed. They also have modern, sixth generation nuclear-capable strategic bombers and submarines.

China is capable of executing any plausible nuclear employment strategy regionally now and will soon be able to do so at intercontinental ranges," Richard said. Russia, however, remains the "pacing nuclear strategic threat," aggressively engaged in conventional and nuclear capability modernization, which is around 80% complete, he said, adding that the U.S. nuclear modernization effort has not yet started.

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said, adding that the U.S. nuclear modernization effort has not yet started. Given these threats, modernization of the nuclear triad is the department's top priority, he said. "We're at a point where end-of-life limitations and [the] cumulative effects of underinvestment in our nuclear deterrent and supporting infrastructure, against the expanding threat, leave me no operational margin. Our nation simply cannot attempt to indefinitely life-extend leftover Cold War weapon systems and successfully carry out the assigned strategy" Richard said.

Army Gen. James H. Dickinson, the commander of U.S. Space Command, said that China's space enterprise continues to mature rapidly, presenting

a “pacing challenge for us.” They invest heavily in space with more than 400 satellites in orbit today. China is building military space capabilities rapidly, including sensing and communication systems, and numerous anti-satellite weapons, he said, noting that they are doing all this while maintaining their public stance against the weaponization of space. Similarly, Russia’s published military doctrine calls for the employment of weapons “to hold us and allied space assets at risk,” Dickinson said.

Facing these threats, Spacecom is focused on enhancing existing and developing new space awareness capabilities that will provide better insight into activity throughout the space domain, including potential adversary activities, he said. “Our intent is to build the appropriate space operational architecture designed to achieve full operational capability, backed by a team of war fighters who can outthink and outmanoeuvre our adversaries,” he added.

Source: <https://www.defense.gov/Explore/News/Article/Article/2579031/us-facing-increasing-nuclear-space-based-threats-leaders-say/>, 20 April 2021.

OPINION – Seyed Hossein Mousavian

Iran-Israel Tensions: Return to Nuclear Deal, or See Region Go Up in Flames

With continued Israeli sabotage and in the absence of a revival of the nuclear deal, we could see the proliferation of nuclear-arms programmes and the outbreak of new wars. Ten days after an explosion, widely attributed to Israeli sabotage, cut off electrical power to the centrifuges at Iran’s main underground uranium-enrichment facility at Natanz, a Syrian surface-to-surface missile exploded near Israel’s Dimona nuclear reactor, resulting in tensions running high in the

region. The Natanz attack came just before a second round of talks in Vienna between Iran and the five permanent members of the UN Security Council plus Germany, aimed at reviving the 2015 nuclear deal. Israel fiercely opposed the deal, and former US president Donald Trump withdrew from it in May 2018. Iran’s foreign ministry has blamed Israel for the Natanz attack, calling it “nuclear terrorism” and a “crime against humanity”. In response to the sabotage, Iran announced that it would activate 1,000 advanced centrifuges at Natanz and begin producing a small amount of uranium enriched to 60 percent, close to the 90-percent level considered to be weapons-grade.

There is little doubt that the sabotage was aimed at undermining US President Joe Biden’s decision to revive the nuclear deal. “The past week has underlined a sharp divergence in US and Israeli interests,” noted a Washington Post editorial. In addition to the negative political and security consequences of Israel’s opposition to reviving the Iran nuclear deal, there are other ramifications. Technically, there is a huge difference between Iran’s nuclear programme and that of Libya, for example, which attempted to import an enrichment plant as a kit requiring only assembly. Iran built its programme from the bottom up, starting with research and development in its universities and then going on to industrial development in its machinery and electrical sectors. It is true that the first generation of Iranian centrifuges were simple copies of first-generation Pakistani centrifuges provided by the Abdul Qadeer Khan network, which were in turn based on an early Dutch design with an aluminium rotor. The Pakistani design, to which Iran has been limited by the nuclear agreement, is not comparable to the much more efficient designs currently deployed by the European multinational enrichment company, Urenco.

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Strategic Error: In the meantime, however, following the line of development pursued by Urenco, Iran's centrifuge experts have been able to develop new generations of much more advanced centrifuges with rotors made of carbon-fibre reinforced composites. By sabotaging Natanz, Israel might therefore have made a strategic mistake by creating an opening for Iran to replace its old, inefficient centrifuges with much more advanced designs, reportedly up to 50 times faster than the first-generation IR-1s to which Iran was limited by the 2015 nuclear deal.

In the last two decades, Iran has also made progress in building small submarines, and has expressed an interest in developing nuclear-powered submarines, similar to those developed by the US, Russia, Britain, France, China and India. The US and Britain use uranium enriched to more than 90 percent to make compact reactors that do

not have to be refuelled during the lifetime of a submarine. Iran has thus used the example set by the US and Britain to justify its plans to produce 60 percent enriched uranium for its naval programme. In recent decades, Iran's nuclear scientists - some of whom have been assassinated by Israel - have formed a cadre of nuclear experts without access to international academic training. Specialists have been trained in Iranian universities in the fields of nuclear physics and nuclear engineering. No one should underestimate Iran's human resources; Iran's nuclear programme can no longer be destroyed by sabotage or bombing.

Increased Leverage: Three years after Trump's withdrawal from the nuclear deal, Iran increased its uranium enrichment level from 3.67 percent to 20 percent. After the Israeli sabotage, that figure reached 60 percent. The history of Iran's nuclear programmes how's how, in response to US and Israeli coercion, Iran

Three years after Trump's withdrawal from the nuclear deal, Iran increased its uranium enrichment level from 3.67 percent to 20 percent. After the Israeli sabotage, that figure reached 60 percent. The history of Iran's nuclear programmes how's how, in response to US and Israeli coercion, Iran has increased the capacity of its nuclear programme to increase its own leverage.

has increased the capacity of its nuclear programme to increase its own leverage. It therefore appears likely that, in the absence of a revival of the nuclear deal and with continued Israeli sabotage, the deal will not survive - and the end state will be a nuclear-armed Iran. According to an editorial in the conservative Kayhan newspaper, Iran should "walk out of the Vienna talks, suspend all nuclear commitments, retaliate against Israel and identify and dismantle the domestic infiltration network behind the sabotage".

But there is an alternative path forward: save the Iran deal. Under the agreement, Iran accepted the most comprehensive transparency measures and limits that a member state of the Non-proliferation Treaty has ever accepted. This model should be accepted by other countries pursuing nuclear-energy programmes. For the international community, therefore, preserving the

Iran deal must be a vital first step towards strengthening the non-proliferation regime.

The nuclear deal also provides a potential foundation for a nuclear-weapons-free zone in the Gulf. In 2019, Iranian President Hassan Rouhani presented to the UN a proposal for a Hormuz Peace Endeavor, including a broad spectrum of ideas for cooperation and security around the Gulf, such as arms control and establishing a zone free of weapons of mass destruction. If the Iran nuclear deal is allowed to collapse, there will be zero chance of realising such a zone. Instead, we could see Saudi Arabia pursuing its own nuclear-weapons programme, and perhaps Turkey and Egypt as well. Of course, Israel and the US would feel compelled to try to stop them, with more wars the likely result. This is what's at stake in the current negotiations in Vienna.

Source: <https://www.middleeasteye.net/opinion/iran-israel-tensions-nuclear-talks-region-stability-stake>, 22 April 2021.

OPINION – Manpreet Sethi

The Nuclear Taboo & South Asia: Reviewing Nina Tannenwald's "23 Years of Nonuse"

In her recent policy paper for the Stimson Center, Nina Tannenwald provides an insightful assessment of the nuclear taboo, or the normative inhibition against the first use of nuclear weapons, in South Asia. Coherently structured, the paper examines the nuclear behavior, pronouncements, and doctrines of India and Pakistan since their nuclearization. Based on a rich literature survey, she concludes that the taboo is weak in Pakistan and weakening in India, largely due to certain internal factors, and partly because both have been in possession of nuclear weapons for only a short period of time.

Offering another perspective, I argue that these factors do not support such a conclusion. In fact, the nuclear taboo is neither weak in Pakistan nor under stress in India. Rather, I draw greater attention to her argument that "the taboo appears to be at risk everywhere." Therefore, in tandem with the global environment, which seems to have become more permissive of certain kinds of nuclear behavior and use of language, there is an appearance of the weakening of the taboo in India and Pakistan too, even though it remains intact in both states.

Before examining individual state approaches to the taboo, a general point needs to be mentioned. The tradition of nuclear nonuse by Cold War superpowers that helped to create the nuclear taboo was aided by the geographical distance between the two ideological rivals and the luxury of fighting proxy wars. Territorial confrontations on their own soil, which could have prompted nuclear use, were virtually absent. Bilateral agreements, "which established some norms and rules of crisis management," also helped rationalize their arsenals and keep the other from gaining an undue quantitative or qualitative

advantage. By ensuring a *modus vivendi* with nuclear weapons, these mechanisms upheld the tradition of nonuse, and thus strengthened the taboo.

South Asia, in contrast, houses geographically contiguous nuclear powers with historically unresolved territorial disputes. Moreover, support for terrorism by one nuclear state against another adds a new dimension. These complex security conditions significantly raise the possibility of war, including to the nuclear level, which could break the taboo. Yet, a level of restraint has been practiced. This demonstrates an understanding of nuclear risks, and the strength of the taboo, even if no stability arrangements of Washington-Moscow kinds have been concluded.

Specificities of Approach to Nuclear Taboo – India:

Tannenwald grants that India has a strong sense of the nuclear taboo. However, she identifies two developments to argue that the taboo is weakening in India – doctrinal drift from NFU and the adoption of a more aggressive nuclear posture. However, when contextualizing these developments, this

interpretation renders a different conclusion.

The "doctrinal drift" away from NFU identified by Tannenwald is gleaned from statements. Some of these have been made by once influential civilian bureaucrats, military, and political leaders. Now retired, they are freely expressing their personal views, but are no longer in the official decision-making loop. Some prominent standing political leaders are also referenced, such as an August 2019 statement by the current Defence Minister and one by Prime Minister Modi at an election rally later that year. Both these pronouncements stand out because they are uncharacteristic for India, which is not prone to making loose nuclear references.

However, these deviations from the norm can be attributed to two factors: first, electoral jingoism,

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which is common in democracies. The speeches, amidst a national election in 2019, capitalized on the just-ended crisis with Pakistan to showcase the ruling BJP's resolve to punish terrorism; second, irreverent references to the use of nuclear weapons by leaders of countries not traditionally prone to nuclear bombast. If former U.S. President Trump and Russian President Putin, could become so casual in approach to nuclear weapons, is it surprising that it percolated to others too? Tellingly, the effect of U.S.-DPRK "hyperbolic rhetoric and provocative actions" was considered one of the reasons by the Bulletin of Atomic Scientists to set the Doomsday Clock at two minutes to midnight in 2018, and its retention there in 2019. The resultant mood of nuclear permissiveness was echoed in statements from Indian officials.

However, it should be noted that in more sober settings, the Indian government has reiterated its commitment to NFU. For example, in March 2020 during a session at Parliament, the government underscored its policy of NFU, and repeated it in February 2021 during a speech by the Foreign Secretary at the Conference on Disarmament.

A doctrinal drift from NFU will not come lightly given India's nuclear doctrine is predicated on its strategic culture, which can be traced not merely to "Gandhian non-violence" but also to a millennia old civilizational history that has refrained from the use of force as a first resort. There is, therefore, a historical alignment of thought with the taboo. The "mileage" that seems to have accrued to India is a collateral benefit of these pre-existing beliefs. It has come

along not because it was so intended, but because NFU is believed to be morally and ethically more responsible than a reliance on brandishing first use. In fact, India repeatedly advocates the universalization of NFU as a step towards reducing the global salience of nuclear weapons and move towards a nuclear weapons free world. It wants the taboo strengthened, not weakened.

In support of her second point about India's adoption of an aggressive nuclear posture, Tannenwald flags that India is "emphasizing higher readiness, and filling out the pieces of its nuclear triad with intercontinental missiles and nuclear-armed submarines." But, these are capabilities for a credible NFU that India had defined in its draft nuclear doctrine in 1999. It had, at that point in time, identified the need to build "sufficient, survivable and operationally prepared nuclear forces." With technological maturation, these capabilities are being developed, tested, and operationalized as part of a pre-existing plan.

Besides flagging these developments, some scholars have hinted that certain technologies being pursued by India, such as "precision strike weapons and target acquisition capabilities" could equip India with a "limited capability to disarm Pakistan." Tannenwald cites these sources to argue that such moves indicate a weakening of the taboo, even though India itself has never spoken about nuclear counterforce.

In fact, given India's nuclear philosophy, which eschews the idea of fighting a nuclear war, there is no room, nor military sense, in a "limited disarming" of Pakistan's nuclear weapons. India has never endorsed the idea of TNWs or MIRVed missiles, as have its neighbors. Secondly, India

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would rather use precision technologies and better ISR for conventional requirements, à la Balakot air strikes, which were carefully calibrated to minimize collateral damage. Thirdly, India maintains that nuclear weapons are dramatically different from conventional weapons. Tannenwald acknowledges that countries that make a distinction between nuclear and conventional systems have a stronger sense of the taboo. There are no indications that this has been diluted in India given its conscious decision to allocate a nuclear role to only ballistic missiles and keep cruise missiles conventional so as to remove ambiguity and reduce chances of inadvertent escalation.

Tannenwald's conclusion, then, that the taboo is weakening in India, does not appear to be on firm ground. Indeed, loose and uncharacteristic statements have been made, but in a context explained above. Capability build-up is happening, but according to a long-known template focused on survivability of India's nuclear arsenal for a credible NFU. Lastly, it cannot be overlooked that for a country that believes in deterrence through punishment, not denial, the taboo will continue to be important.

Specificities of Approach to Nuclear Taboo – Pakistan:

Tannenwald argues that Pakistan's sense of the nuclear taboo is weak because of its nuclear nationalism and perception that nuclear weapons are the state's only defense against India. Indeed, during crises, from Kargil in 1999 to Pulwama in 2019, Pakistani leaders have employed a deliberate strategy that vociferously draws attention to their nuclear arsenal and brandishes its possible use to deter Indian military retaliation. However, it should not be construed that Pakistan military's decision

to use nuclear weapons would be early or easy, as demonstrated by its own crisis behavior.

The projection of a low-use threshold, or engendering a sense of instability, becomes a compulsion for Pakistan owing to its need to deter a conventionally superior Indian military, while continuing to support cross-border terrorism as a way of bleeding India. If Pakistan were to accept nuclear stability by agreeing, for instance, to the doctrine of sole purpose or NFU, it fears a subsequent conventional conflict with India. Since avoidance of such a situation is the precise purpose of its nuclear weapons, Pakistan prefers to heighten risks through deployment of tactical nuclear weapons, and creation of entanglement dilemmas through dual-use missiles. This does not mean the taboo is weak but rather that projecting instability is perceived to bring greater deterrence benefits than vocal support for the taboo.

Tannenwald is right that the risks created by Pakistan's posture could heighten with each passing crisis. While Islamabad believes that it can manage instability, the problem arises when India deviates from an assumed response, as it did with surgical strikes in 2016 and air strikes in 2019. In doing

so, India chose to manipulate the phenomenon of risk escalation, a behavior normally adopted by Pakistan. This resulted in both sides showing an unprecedented willingness for risk-taking. But, it is important to note that both states were hesitant to deliberately increase the risk that escalation would spiral out of control. Pakistan took retaliatory action but whether it was a pre-planned move not to deliberately hit military

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Both states were hesitant to deliberately increase the risk that escalation would spiral out of control. Pakistan took retaliatory action but whether it was a pre-planned move not to deliberately hit military targets but only to "lure Indian fighters," or a case of luck that the bombs did not fall on Indian Army installations, another round of escalation was avoided.

targets but only to “lure Indian fighters,” or a case of luck that the bombs did not fall on Indian Army installations, another round of escalation was avoided.

Were India and Pakistan constrained by the nuclear taboo? Will they be in the future? While this cannot be stated definitively, and the sentiment on the taboo generated at the global level will matter, it remains true that the taboo is a factor of consideration. Of course, it can never be the only factor, and hence, its influence on this dyad, as on any else, cannot be overstated.

Impact of the Global Nuclear Environment:

Perceptions of the strength and weakness of norms related to nuclear use evolve with collective enforcement by all stakeholders, and not by length of period of its existence in one specific dyad. Therefore, I differ from Tannenwald’s view that “the taboo is inherently less powerful in the newer nuclear states,” like in India and Pakistan, because their tradition of non-use is only 23 years old. Instead, the salutary effect of the taboo, including in South Asia, arises from its global enforcement. But, both the U.S.-Russia mistrust that “normalizes” an offense-defense spiral and the U.S.-DPRK nuclear jingoism have created adverse perceptions.

Tannenwald is right that strengthening the nuclear taboo is in the interest of India and Pakistan, as it is with all nuclear nations. Her recommendations are meaningful, but not just at the narrow regional level. A global reinforcement of the taboo through joint political statements by all, or as many leaders as possible, would be more useful to strengthen the taboo everywhere. Similarly, refreshing public memory about the disastrous consequences of deterrence breakdown through movies that graphically depict the impact on socio-politico-economic-environmental “threads” the day after nuclear use would also be helpful in building public opinion against nuclear use and

imposing pressure on leaders to take steps towards risk reduction—steps that would strengthen the taboo.

With regard to the specific suggestion on India-Pakistan nuclear arms control (NAC), this is difficult not only because of the current state of the bilateral relationship at the political level, but also the more troublesome issue of how to include China, which casts a definite shadow over Indo-Pak nuclear dynamics. Beijing’s aggressive behavior throughout 2020 and growing military strength has added to India’s threat perceptions. It is therefore pertinent to assess China’s perception of the taboo. Given its habitual disdain

for global norms, how does it perceive the constraining influence of the taboo? This is a question for further research.

Meanwhile, though NAC is absent in Southern Asia, India and Pakistan do have in place some progressive nuclear CBMs: the 1988

agreement on non-attack on nuclear facilities, pre-notification of ballistic missile tests and creation of hotlines initiated by the 1999 Lahore Memorandum of Understanding, and, since 2007, notification of the other in case of nuclear weapons related accidents. These make for substantive CBMs, but the persistence of elevated threat perceptions has not fostered confidence in the other’s nuclear behavior.

The constraining influence of the taboo in South Asia remains unchanged. India accords it significance and has said so; Pakistan does too, but compulsions of its nuclear strategy do not allow a full-throated endorsement. For both countries, though, as for others, the perception of the strength or weakness of the taboo is shaped by the nuclear behavior of others, especially that of major states. Of course, nuclear behavior of India and Pakistan also adds to this perception. Therefore, the calculation of the taboo’s weight in any region cannot be done in isolation from the global context.

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Source: <https://southasianvoices.org/the-nuclear->

taboo-south-asia-reviewing-nina-tannenwalds-23-years-of-nonuse/, 21 April 2021.

NUCLEAR STRATEGY

USA

The Pentagon Wants More, Better Nuclear Weapons

Admiral Charles Richard, the Commander of U.S. STRATCOM—America’s military organization in charge of the nukes—went to Washington on 20 April (Tuesday) to ask the Senate for new nukes. “Sustainment and modernization of our nuclear forces...has transitioned from something we should do, to something we must do,” Richard said in a prepared statement ahead of his testimony.

Admiral Richard testified before the Senate Armed Services Committee as part of a routine examination of Pentagon budgets. As the Commander of STRATCOM, Richard was mostly interested in pleading for more money for better nuclear weapons. According to Richard, Russia and China are so dangerous that America can’t afford to not replace its old nukes with new ones.

America’s nuclear weapons infrastructure is crumbling. Some of our ICBMs have been around since the 1970s. Much of the Command and Control systems that facilitate communication between America’s various nukes and warmachines runs on ancient computers. The Pentagon only got the system off of floppy disks in 2019.

According to Richard, there’s no margin of error in the Defense budget. “If we find out we were wrong, decision to divest or delay could take ten to fifteen years to recover and render the nation

unable to respond to advancing threats,” he said. “Any decision to delay or defer recapitalization requires us to be absolutely sure, for the next 40 years, that we don’t need that capability to deter threats, many of which we can’t predict.”

“Peace is our profession,” is the motto of STRATCOM. It’s view of the world is very particular. In the logic of STRATCOM, America stops countries like Russia and China from ever using a nuke by keeping the entire planet under constant threat of nuclear annihilation. The idea that America might unleash nuclear hell is so horrifying—and, crucially, so possible—that China and Russia would never dare attack it with either conventional or nuclear weapons.

STRATCOM’s strategy relies on some dark assumptions about human nature. And in Richard’s written and oral testimony, he repeatedly hammered home the idea that China was a terrifying new nuclear threat. China is a country with, according to 2020 Pentagon estimates, is in the “low-200s” and maintains an unconditional “no-first use” nuclear policy.

America has a total of around 5,500 nuclear weapons. Around 1,700 of those are deployed, meaning they’re in missile silos, sitting ready to go on bombers, and are stored in submarines that travel the planet. America has deployed 1,500 more nukes than the Pentagon estimates China has total. But Richard and others believe China is quietly building more and better nuclear weapons. Secret nukes it isn’t telling the world about. “These capabilities bring into question China’s stated ‘No First Use’ policy declaration and implied minimum deterrent strategy,” Richard said.

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The world according to Richard and STRATCOM is a frightening place. It's one where China is building its nuclear arsenal, North Korea has ICBMs pointed at the U.S., and Russia is developing devastating new nuclear weapons. Some of that is true, but much of it is the same kind of paranoia that's fueled nuclear brinkmanship for generations. "I am expected to deter all countries all of the time," Richard said during his hearing. "I think it's important to remember that a lot of the quantities we're talking about in these requirements were set when the threat level was actually much more benign than what we're seeing now."

According to the Federation of American Scientists there were 70,300 nuclear weapons on the planet in 1986. Now it estimates there are 13,100. We've got far fewer nukes now than a generation ago, but the threat of these weapons will remain as long as people like Richard view nuclear war as a zero-sum game with possible winners.

During his testimony, Richard said America needed better nukes to deter the modern threat of Russia and China. He even advocated for putting U.S. Air Force bombers in the air armed with nuclear bombs should America's ICBM silos fall to ruin. America did that before. In the years after World War II, the U.S. maintained the credible threat of nuclear annihilation against its enemies by flying bombers in the air above the world 24 hours a day and 7 days a week. It was a disaster. The pilots, often strung out on amphetamine and working long shifts, lost nuclear weapons in various accidents.

One accident in 1966 saw the loss of 4 nuclear bombs. One burst open and released a radioactive cloud that irradiated Spanish farmland. Two years later, in 1968, a B-52 crashed in Greenland, lost a nuke, and irradiated the ice. It took years to clean

up the radioactive material. This is the world Richard advocates returning to, should the U.S. be unwilling to spend billions to refurbish its aging nuclear weapons.

Source: <https://www.vice.com/en/article/v7egxd/the-pentagon-wants-more-better-nuclear-weapons>, 21 April 2021.

BALLISTIC MISSILE DEFENCE

CHINA

'Terminator of Drones': China Unveils Stealth-Detecting Radars

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China has unveiled new advanced radars that could detect stealth aircraft, including drones, as well as low-flying cruise missiles, as the country continues to aggressively boost its fighting capabilities and flexes its

military muscle amid emerging tensions in the region. Among the "star products" at the Nanjing exhibition, which ended on 24 April 2021, is the country's first portable and multipurpose radar, which could be carried by a single soldier, according to the state-owned publication, Global Times. The equipment is being dubbed the "terminator of drones" for its capability to detect

small and slow targets that blend themselves under strong noise waves by flying close to the ground. The so-called "YLC-48 radar" can "effectively detect and track incoming targets from any angle", according to its developer, the No 14 Research Institute of the

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The radar uses digital integrated circuits, and it can be mounted on all kinds of lightweight weapons platforms, can conduct missions under all-weather conditions, and can be rapidly deployed and withdrawn, the report said. The

institute has also reportedly developed an Anti-UAV Defence System (AUDS) for the radar, enhancing the country's defence capabilities "in sensitive regions". As the coronavirus pandemic rages around the world in 2020, tensions have also been brewing in the region over multiple issues, where China has found itself in a direct course of political collision with the US. Washington and Beijing remain at odds over China's policies in Hong Kong and its treatment of Uighurs in its north-western Xinjiang region – issues that Beijing considers as domestic affairs.

Tracking Cruise Missiles: China also bristles at the increasing closeness between the US and Taiwan, which Beijing considers a renegade province. In 2020, China threatened to "make legitimate and necessary responses" after the US approved the sale of \$1.8bn worth of advanced weapons systems to Taiwan. In recent weeks, China has conducted military exercises involving its aircraft carrier in the waters near Taiwan. It has also been accused of deploying its aircraft in Taiwan's air defence zone (ADIZ) on an almost daily basis. In response, the US has held several joint military exercises with China's neighbours including Japan, Taiwan and the Philippines, and dispatched its own naval fleet to conduct "freedom of navigation" trips in the disputed South China Sea.

With the increasing tensions in the region, Beijing has also ramped up its military spending in recent years. In 2019, China launched a new hypersonic ballistic nuclear missile believed to be capable of breaching all existing anti-missile shields deployed by the US and its allies. In 2020, it was reported that China is working to double its nuclear warheads. China has also stepped up its use of

unmanned aerial vehicles, as well as its anti-drone radar capabilities.

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At the exhibition in Nanjing, another anti-drone radar system making its first public appearance is the S-band 3D TWA, a low-altitude surveillance radar. According to the Global Times report, the new radar system "can simultaneously detect and track targets including low-flying cruise missiles, warplanes and small drones". "It will be

deployed in key locations like cities, nuclear plants and military facilities," the developer was quoted by the report as saying. ...

Source: <https://www.aljazeera.com/news/2021/4/24/terminator-of-drones-china-unveils-stealth-detecting-radars>, 24 April 2021.

USA

Budget First Small Step in Long, Expensive Path to Upgrading North American Defences

The federal budget unveiled on 19 April, 2021 included more than \$100 billion in new spending over the next few years. Of that, \$163 million has been earmarked for what the government calls NORAD modernization.

It was only a few lines in the federal budget, and the money involved represents a rounding error in the overall scheme of things. For defence officials and experts who have been sounding the alarm about North America's aging

defences in an increasingly turbulent world, however, it represented an important step: the first real funding to update the North American Aerospace Defence Command. Yet there remain many unanswered questions, including what that those new defences will look like, how fast they will be built — and whether the rest of the money required to finish the project will be available when needed. "This is a step forward," said University of Manitoba professor James Fergusson, one of Canada's top experts on NORAD.

"There was some money. It's not very much, but

at least the government has started to move. The question becomes: How pressing is all this?" The federal budget unveiled on 19 April, 2021 included more than \$100 billion in new spending over the next few years. Of that, \$163 million has been earmarked for what the government calls NORAD modernization. "This funding will enable the enhancement of all-domain surveillance of our northern approaches and renewed investment in continental defence more broadly," Defence Minister Harjit Sajjan's spokesman Daniel Minden said in an email.

"Our government is determined to develop better surveillance, defence and rapid-response capabilities in the north and in Canada's maritime and air approaches. We are currently evaluating further NORAD modernization initiatives, which will be announced when finalized."

The US and Canada created NORAD in the 1950s to protect North America from a Soviet nuclear attack. Strings of radars and air bases were built to detect and stop incoming missiles and bombers, and placed under a unique joint command. Yet military officials and experts have been cautioning in increasingly loud voices about the state of the current system, which includes a string of radars built in Canada's far north in the 1980s called the North Warning System. Officials and experts have emphasized the physical age of the system's technology and infrastructure, and its inability to find and identify new types of weapons being developed by Russia and other adversaries. Those include low-flying cruise missiles and extremely fast hypersonic missiles, which are much more difficult to detect and stop than the massive intercontinental ballistic missiles and long-range bombers for which NORAD was originally designed. In fact, military officials have warned the system can't even detect Russian bombers before they are in position to launch an attack. Canada and the US have talked for years about replacing the existing system, with Justin Trudeau discussing it in his inaugural meetings with both Donald Trump and Joe Biden when they became President. It is also promised in the Liberals' 2017 defence policy. Yet progress has been extremely slow, which has contributed to a

sense of frustration in some military circles. The project also didn't have any dedicated Canadian funding attached to it — until now.

"This is the amount of money that will be invested to sort of get things rolling," retired Canadian diplomat Michael Dawson, who served as an adviser to the commander of NORAD in Colorado Springs, Colo., said of the \$163 million. "It strikes me as a pretty good sign that they really do plan to deliver on the NORAD commitment." Fergusson believes the new money will be largely directed at the Defence Department's research arm, Defence Research and Development Canada, to start work on ideas and technology. One question will be what to include in the new system given how fast weapons are evolving, including whether it will revolve around ground-based radars, satellites or other technology. There has also been talk about artificial intelligence and quantum computing to speed up detection and decision-making, while a debate is pending around the degree to which Canada will participate in not just identifying threats, but also stopping them.

Canada famously opted out of joining the US in ballistic missile defence system in 2005, which involves shooting incoming nuclear missiles out of the sky. It will likely need to wrestle with the issue again along with what to do about other threats. Such discussions and research will come against a backdrop of growing urgency as the existing system becomes increasingly obsolete and in recognition of the glacial pace of the military procurement system and the challenges of building in the Arctic. ...

Yet Fergusson worries that there isn't enough of an appreciation in Ottawa — and the Canadian public, in general — about the importance of the project, which he suggests is important for relations with the US and sending a message to adversaries about Canada's resolve. Military officials have previously said failing to replace the current system would hamstring any response to Russian or Chinese aggression here and around the world as those countries could effectively hold North America hostage by threatening strikes. There are also questions about whether the

government will provide the necessary cash, which some estimates put at more than \$10 billion, when it comes time to start construction. That may not seem like a big concern now, when the government is promising \$101 billion in new spending over the next three years, but the military has previously seen major spending cuts when governments want to slash the deficit. The fact the government has yet to dedicate any specific funds to the project aside from the \$163 million in the budget adds to those concerns about billions more dollars being available for NORAD in the coming years. ...

Source: https://www.kamloopsbcnow.com/news/news/National_News/Budget_first_small_step_in_long_expensive_path_to_upgrading_North_American_defences/#fs_97989, 24 April 2021.

United States has Developed New SM-6 Block IB Missile Able to Shot Down Hypersonic Threats

According to information published by the Missile Defence Advocacy Alliance website, the US has developed a new version of the SM-6, a missile in current production for the US Navy. The SM-6 Block IB will be able to shot down hypersonic missiles.

The SM-6 was designed by the American company Raytheon to provide capability against fixed and rotary-wing aircraft, unmanned aerial vehicles, anti-ship cruise missiles in flight, both over sea and land, and terminal ballistic missile defense. It can also be used as a high-speed anti-ship missile. The SM-6 is a multi-mission missile that can perform anti-air warfare, ballistic missile defense, and anti-surface warfare missions. It is a two-stage missile with a booster stage and a

second stage. The missile has a 64 kg blast fragmentation warhead and has an operational range of 240 km.

According to a report the US Congress, the United States Missile Defense Agency (MDA) and Space Development Agency (SDA) are currently developing elements of a hypersonic missile defense system to defend against hypersonic weapons and other emerging missile threats. According to a report of the U.S. Senate, the United States Department of Defense works with the U.S. Missile Defense Agency to

accelerate a comprehensive layered defeat capability against adversary tactical hypersonic weapons including kinetic defense in the terminal and glide phases of flight, as well as left-of-launch strike of missile launch complexes. The U.S. DoD is investing in technologies and studying capabilities to defeat regional offensive hypersonic weapons, the first element of which is to detect and track incoming missile threats. Citing *The Drive* website, The U.S. MDA, in cooperation with the U.S. Navy, demonstrated early capability against manoeuvring threats during flight-testing of the Standard Missile (SM)-6 Sea-Based Terminal (SBT)

defense, and it will further demonstrate this capability against an advanced manoeuvring threat-representative target later this year, said Senator Barbara McQuiston. ...

Source: <https://www.navyrecognition.com/index.php/focus-analysis/naval-technology/10004-united-states-has-developed-new-sm-6-missile-able-to-shot-down-hypersonic-threats.html>, 16 April 2021.

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NUCLEAR ENERGY

CHINA

China to Begin Construction of Hualong Two in 2024

China National Nuclear Corp (CNNC) said on 14 April that it expects to start construction of its first Hualong Two, an advanced model of its third-generation power reactor, by 2024, Reuters reported. Construction of the Hualong Two will take four years to build compared with the average five years it takes for Hualong One units, Cao Shudong, CNNC vice general manager, told a nuclear forum in Beijing. Construction costs will drop by about a quarter to CNY13,000 (\$1,990) per kW, from CNY17,000 per kW with the Hualong One design, he said. Cao told Reuters the Hualong Two would be simplified compared with the Hualong One but that this would not compromise safety, and that the basic technology would remain the same. Cao did not specify the capacity the Hualong Two.

The Hualong One is a third-generation pressurised water reactor developed and designed by CNNC based on more than 30 years of nuclear power research, design, manufacturing, construction and operation experience, the company said. It has a design life of 60 years and a 177 assembly core design with an 18-month refuelling cycle. The power plant's utilisation rate is as high as 90%. CNNC said its active and passive safety systems, double-layer containment and other technologies meet the highest international safety standards.

China's first Hualong One reactor at unit 5 of the Fuqing NPP in Fujian Province began commercial operation in January. Nine more are under construction in China or planned. CNNC is building another unit (Fuqing 6) in Fujian Province, scheduled for start-up in 2021. CNNC is also

constructing one unit (the first of two) at Taipingling in Guangdong and two at Zhangzhou in Fujian province. China General Nuclear is building two at its Fangchenggang site in Guangxi province. First concrete was poured in March for unit 3 at China Huaneng's Changjiang NPP in Hainan province after the National Nuclear Safety Administration issued a construction licence for Changjiang 3&4 (phase II) - both Hualong One units. In addition, two Hualong One units are under construction at Karachi in Pakistan, while CGN proposes to use a UK version of the Hualong One at the planned Bradwell site in the UK.

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Source: <https://www.neimagazine.com/news/newschina-to-begin-construction-of-hualong-two-in-2024-8673029>, 15 April 2021.

China Gives Green Light to Nuclear Units to Cut

Carbon, Sources Say

China approved the construction of five nuclear power units, with total installed capacity of 4.9 GW, roughly 10% of the country's total, two sources said, as Beijing strives for alternatives to fossil fuel to meet its climate goals.

China needs to speed up its nuclear development to achieve its pledge to bring greenhouse gas emissions to a peak before 2030 and become "carbon neutral" by 2060. The world's biggest greenhouse gas emitter has lagged behind its previous target of operating 58 gigawatts of nuclear power capacity by 2020, partly as the Fukushima nuclear accident slowed down approvals of new projects. China's state council approved five nuclear projects, which will be developed by China National Nuclear Corp. (CNNC), at a meeting on 14 April, 2021....

Nuclear power is a 'have to do' choice if China aims to achieve the targets of bringing carbon emission by 2030 and reaching carbon neutrality by 2060," an official from the Nuclear Safety Bureau said.

Officials, including those from the National Energy Administration and National Nuclear Safety Bureau, attended the meeting at which the development of the nuclear industry in the country

was discussed, four sources said. They asked not to be named because they were not authorized to speak to the press. "Nuclear power is a 'have to do' choice if China aims to achieve the targets of bringing carbon emission by 2030 and reaching carbon neutrality by 2060," an official from the Nuclear Safety Bureau said.

The five reactors approved include four regular nuclear units — number 7 and number 8 at Tianwan nuclear power plant in eastern Jiangsu province, and number 3 and number 4 in Xudapu in north-eastern Liaoning province. All four will use Russian-made VVER-1200 technology and have individual capacity of 1.2 gigawatts (GW), two of the sources said. The government also approved a small, 125-MW module reactor (SMR) demonstration project at Chang jiang nuclear power plant in Hainan province. In one of the country's first experiments of small reactors aimed at better economics, CNNC will use its home-grown ACP100 technology. Construction of three of the five units, the SMR and one each from Tianwan and Xudapu, is expected to start later this year and is scheduled for completion in 2026, one official said. "They are moving ahead as earlier scheduled," the official said, adding that means China has re-established its normal pace in advancing new projects. The State Council and CNNC did not immediately respond to Reuters requests seeking comment.

China is also accelerating the development of an upgraded model of its home-grown third generation nuclear technology, Hualong Two. China's Nuclear Energy Association expects the country to have installed or have under construction a total of 200 GW of nuclear capacity by 2035.

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The small EU member state and former Soviet Republic, has for decades generated energy for its 1.3 million people by burning carbon intensive oil shale and making up shortfalls through its connection to the Russian and Belarusian grids. But that lifeline will be phased out in 2025, when Estonia, and its Baltic neighbours Lithuania and Latvia, also former Soviet republics, will synchronize with the European grid via Poland.

Source: <https://www.arabnews.com/node/1843311/world>, 15 April 2021.

ESTONIA

Estonia Mulls Building a Nuclear Plant of its Own

The government of Estonia, the small Baltic state on Russia's western border, is investigating the possibility of building nuclear power plants, establishing a government level working group that will present its conclusions by late 2022, World Nuclear News reported. The

announcement is in line earlier statements from Fermi Energia, an Estonian energy start-up, which declared in February that it would develop first Europe's nuclear plant based on small modular reactors by 2035. "In order to increase Estonia's energy security, sustainability and competitiveness and achieve the 2050 climate targets, the introduction of nuclear energy would be one of the possible solutions," environmental minister Tõnis Mölder said, according to WWN. "Nuclear energy would be able to provide 24/7 electricity, independently of weather conditions, while the process of deploying it would be very long lasting and would require huge investment from the state. The difficult question of what to do with spent nuclear fuel should also be resolved."

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synchronize with the European grid via Poland. At the same time, Estonia, along with the other Baltic states, is boycotting electricity produced by the nearby Belarusian nuclear plant, where a Russian-built VVER-1200 reactor went into commercial service in November 2020. The three Baltic governments have alleged safety violations in the plant's construction and operation, which Rosatom, Russia's state nuclear corporation, denies. A number of unscheduled shutdowns of the reactor just days after the new reactor came online has only served to heighten those fears. In December, a scheduled safety meeting at the Belarusian plant with European Union officials was cancelled when plant representatives failed to prepare for the visit.

... Mölder said the government working group will analyse technologies and actual projects under development in other countries and assess whether the development of a nuclear power plant should be carried out by the state or the private sector and what the possibilities for private-public cooperation could be. The recent developments are not Estonia's first flirtation with the idea of building a nuclear power plant. Eesti Energia, Estonia's state-owned energy company, considered building a nuclear plant are part of a joint venture with Latvia and Lithuania during the first decade of this century. The plant would have been located near the Soviet-built – and now decommissioned – Visaginas nuclear plant in Lithuania. The plans, however, were not realized.

Source: Charles Digges, <https://bellona.org/news/nuclear-issues/2021-04-estonia-mulls-building-a-nuclear-plant-of-its-own>, 14 April 2021.

GENERAL

Climate Leaders Must Include Nuclear in Net-Zero Debate

The Canadian Nuclear Association, Europe's Foratom, the Japan Atomic Industrial Forum, the USA's Nuclear Energy Institute, the UK's Nuclear Industry Association and World Nuclear

Association have issued a joint statement ahead of the Leaders' Summit on Climate that started on 22 April, 2021. At the invitation of US President Joe Biden, world leaders convened for the two-day event to galvanise efforts to reduce greenhouse gas emissions.

"We have less than 30 years to cut carbon emissions from every sector of our global economy to zero. To meet the urgency and the

The world will need to generate many times more clean energy than we do today. To achieve this will require that we use every low-carbon technology at our disposal. Nuclear power must be one of those technologies.

magnitude of this challenge we must take a realistic, science-based approach that addresses all sectors," the industry groups said. "The world will need to generate many times more clean energy

than we do today. To achieve this will require that we use every low-carbon technology at our disposal. Nuclear power must be one of those technologies." The benefits of nuclear technologies are "unmatched", they said, and include:

- **A proven track record:** nuclear power plants have operated for more than 60 years; they are the largest single source of low-carbon electricity in developed countries and have a long-proven track record in offering an affordable low-carbon alternative to fossil fuel generation.
- **24/7 reliability:** nuclear plants provide a dependable, always-on output. But they can also operate flexibly, supporting the deployment of intermittent renewable generation and ensuring a robust and resilient electricity system.
- **Cost-effective:** Nuclear energy is a cost-effective climate change mitigator. Extending the operation of our current reactors is the lowest-cost form of additional low-carbon generation. New reactors are competitive, particularly when total system costs and the value of avoided emissions are taken into account.
- **Energy services beyond electricity:** nuclear reactors can be used to provide process heat for industry, to desalinate water, produce green hydrogen, and to create synthetic low-carbon fuels as well as to generate power.

· **Jobs and socio-economic benefits:** nuclear energy deployment efficiently promotes national and local economic growth. It provides long-term high-skilled jobs and has significant multiplier effects in many sectors of the economy. For developing countries, where the bulk of world energy demand growth will occur in the decades to come, nuclear can be a huge development contributor, as well as limiting their reliance on fossil fuels.

Today, nuclear innovation is unlocking further possibilities for sustainable development. Nuclear energy is a vital part of a successful transition to a clean energy future. We urge global leaders to put in place technology-neutral policies that will make possible for countries to deploy all the low-carbon options available as they set their action plans to reach net-zero.

· **Scalable:** New designs mean that any country, large or small, can deploy nuclear power, irrespective of their natural resources.

“Today, nuclear innovation is unlocking further possibilities for sustainable development. Nuclear energy is a vital part of a successful transition to a clean energy future. We urge global leaders to put in place technology-neutral policies that will make possible for countries to deploy all the low-carbon options available as they set their action plans to reach net-zero. Do not deprive current and future generations one of the most effective low-carbon generation sources currently available.”

Source: <https://www.world-nuclear-news.org/Articles/Climate-leaders-must-include-nuclear-in-net-zero-d>, 22 April 2021.

UK

There are Plans to Build a £2bn Nuclear Fusion Plant Near Barry

The disused coal-fired power plant on the Bristol Channel coast at Aberthaw, near Barry, is being put forward as a site for the UK's first nuclear fusion plant. The UK Government has committed

£200m to develop plans for a pioneering £2bn nuclear fusion reaction which would create zero-emission in the same way as the sun by fusing hydrogen atoms to make helium.

So far, no fusion reactor has ever created more power than it consumes but several parts of the world are trying to build a viable reactor, which it's hoped would provide emission-free electricity without the radiation problems that come with a nuclear fission plant. The site of the last coal power plant in Wales

at Aberthaw, which closed in 2019, is now being put forward as a possible location after the UK government appealed for potential 100-acre sites in 2019.

It is hoped a reactor could be built by 2040 although there remain concerns about value for money. The planned £2bn plant would only be expected to produce 100MW of electricity, making it much more expensive than other forms of energy.

The Vale council says the development could bring

lots of high-paid and high-tech jobs to the region and potentially play a huge part in cutting emissions of carbon dioxide. During a recent cabinet meeting, Councillor Lis Burnett, deputy leader of the Vale council, said: “Last October, the secretary of state for business, energy and industrial strategy announced £220 million towards the conceptual design for a fusion power station. “STEP stands for spherical tokamak energy production. I have no idea what that means.” The government's fusion scheme is called: ‘spherical tokamak for energy production’. It is a variation on the previous types of reactor shaped like giant doughnuts where atoms have been fused together

to produce heat. The heat is then absorbed by the walls of the tokamak, and turned into electricity.

Fusion technology is the opposite of how nuclear power plants currently work, with 'fission', where atoms are broken apart. Fusion is considered safer and cleaner than fission.

The government is hoping its STEP prototype, which would see a concept design produced by 2024, could help roll out commercial fusion power plants across the world. Construction would then start as soon as 2032, and the power plant becoming operational in 2040. Other sites put forward for a STEP prototype include Ratcliffe-

on-Soar, a coal power station in Nottinghamshire; and Moorside nuclear power station near Sellafield in Cumbria. The government should decide which site to choose by the end of 2022.

Source: Alex Seabrook, <https://www.walesonline.co.uk/news/plans-build-2bn-nuclear-fusion-20446446>, 24 April 2021.

NUCLEAR COOPERATION

INDIA-FRANCE

India Closer to Building World's Biggest Nuclear Plant: French Firm

French energy group EDF took...a key step towards helping to build the world's biggest nuclear power plant in India, a project blocked for years by nuclear events and local opposition. The company said it had filed a binding offer to supply engineering studies and equipment to build six, third-generation EPR reactors in Jaitapur, western India. Once finished, the facility would provide 10 GW of electricity, roughly enough for 70 million households.

Construction is expected to take 15 years, but the site should be able to start generating electricity before its completion. Finalisation of the contract

was expected "in the coming months", an EDF statement said. EDF, which is in exclusive talks with Indian officials, would not build the power plant itself, but would provide the nuclear reactors in a deal that includes US partner GE Steam Power. The state-owned PSU NPCIL controls the national nuclear energy sector, and the EDF offer was

submitted to the country's nuclear operator NPCIL. Although no financial details have been released, the contract is estimated to be worth in the tens of billions of euros (dollars).

It faced opposition however from local inhabitants since the idea was first floated around 20 years ago, and was delayed

after the 2011 nuclear disaster in Fukushima, Japan. The far-right Shiv Sena party, which is powerful in Maharashtra state where Jaitapur is located, campaigned against the plan, though it has become less vocal recently.

EDF estimates the project will create around 25,000 local jobs during the construction phase, and around 2,700 permanent jobs. Earthquake risks and the potential impact on local fishing have been cited as key issues. But Xavier Ursat, head of EDF's nuclear division, told AFP that the company estimates that the site's "geological conditions are excellent and fully comparable to what we find in a country such as France." ...

Source: <https://www.livemint.com/news/india/india-closer-to-building-world-s-biggest-nuclear-plant-french-firm-11619242815330.html>, 24 April 2021.

ZIMBABWE-RUSSIA

Zimbabwe Approves MoU for Nuclear Energy Cooperation with Russia

The government of Zimbabwe...approved a MoU with Russia. The Memorandum seeks to facilitate a high level of cooperation between the two countries in the use of nuclear energy by laying a

EDF estimates the project will create around 25,000 local jobs during the construction phase, and around 2,700 permanent jobs. Earthquake risks and the potential impact on local fishing have been cited as key issues. But Xavier Ursat, head of EDF's nuclear division, told AFP that the company estimates that the site's "geological conditions are excellent and fully comparable to what we find in a country such as France.

foundation for the execution of the agreed areas of cooperation. Information Minister Monica Mutsvangwa confirmed the development at Post-Cabinet press briefing held on 13 April, 2021 “Cabinet considered and approved the MoU between Zimbabwe and the Russian Federation State Atomic Energy Corporation, which was presented by the Attorney General on behalf of the chairman of the Cabinet Committee on Legislation,” she said. The agreement was signed with the Russian state-owned company, State Atomic Energy Corporation. Joint Working Groups will be established to identify specific projects to facilitate the cooperation, including exploring the feasibility of constructing a centre for nuclear science and technology.

In 2019, Zimbabwe joined the global IAEA an initial stage in uranium enrichment. The move then

was necessitated by a dire shortage of electricity as the country only produced 650MW against a national demand of 1,700MW. The country discovered uranium deposits in the coal rich Hwange and Binga districts with exploration still in progress. Zimbabwe has not been spared from the impact of climate change, which has, among other effects, seen the decline of water levels in Lake Kariba. An alternate source of energy will remove dependence on Lake Kariba and hydropower. The anticipated cooperation in the use of nuclear energy for peaceful purposes will strengthen the energy mix and provide alternative sources of energy that Zimbabwe needs.

Source: <https://www.esi-africa.com/industry-sectors/generation/zimbabwe-approves-mou-for-nuclear-energy-cooperation-with-russia/>, 15 April 2021.

URANIUM PRODUCTION

GENERAL

Physicists have Created a New and Extremely Rare Kind of Uranium

Researchers have produced the lightest version of a uranium atom ever. It has only 122 neutrons compared with the 146 neutrons found in more

than 99 per cent of the world’s naturally occurring uranium, which is known as uranium-238.

Isotopes of an element always have the same number of protons – in uranium’s case, 92 – but differing numbers of neutrons. Isotopes are labelled by the total number of protons and neutrons that their nuclei contain, and the new isotope has the lowest number of those particles ever at 214, making it uranium-214. Zhiyuan Zhang at the Chinese Academy of Sciences and his colleagues produced the new isotope through a time-consuming process involving blasting

samples of tungsten with powerful beams of argon and calcium until the atoms fused together. They then picked the uranium-214 atoms out of the sample using a magnetic device called a separator. “The production of these atoms is very

difficult, because not every collision can produce what we want,” says Zhang. “About 10^{18} beam particles were delivered to collide with the target, but only two nuclei of uranium-214 were produced successfully and separated.”

The researchers watched those nuclei decay and determined that the half-life of uranium-214 – the length of time until half of a given sample of particles has decayed radioactively – is about 0.52 milliseconds. They performed similar experiments on two previously discovered isotopes, uranium-216 and uranium-218, and found that their half-lives are about 2.25 milliseconds and 0.65 milliseconds respectively. They also measured how these isotopes decay and found that uranium-214 and uranium-216 undergo alpha decay, in which an atom loses two protons and two neutrons, unexpectedly easily compared with other uranium isotopes. This probably means that the interactions between protons and neutrons in these atoms are more powerful than in others, they say. ...

Source: <https://www.newscientist.com/article/2274847-physicists-have-created-a-new-and-extremely-rare-kind-of-uranium/>, 16 April 2021.

NUCLEAR NON-PROLIFERATION

EU–RUSSIA

EU Suggests Reviving Bilateral Dialogue with Russia on Disarmament, Non-proliferation

The European Union is seeking to restore its bilateral dialogue with Russia on the issues of disarmament and nuclear non-proliferation, Lead Spokesperson for Foreign Affairs and Security Policy of the EU Peter Stano told TASS...commenting on the remark made by Russian President Vladimir Putin who said that Russia strongly urges foreign partners to discuss issues of global stability and draft a "security equation." "The EU works hard to uphold multilateral processes for disarmament and non-proliferation. We have non-proliferation and disarmament dialogues with a dozen states and have proposed to the Russian side to revive our bilateral dialogues on these issues," he noted. Moreover, according to Stano, the EU further encourages "strategic stability talks between Russia and the US." "These are all important settings for an in-depth exchange, to gain understanding of each other's positions, and to look for solutions and potential cooperation," he added.

On 21 April, 2021, Putin delivered his annual State of the Nation Address when he noted that Russia is calling on foreign partners to discuss issues of global stability and draft a "security equation." According to him, "the subject, the goal of such talks may become the creation of an environment for non-confrontational co-existence on the basis of a 'security equation' which would encompass not only traditional strategic arms, intercontinental ballistic missiles, heavy bombers and submarines but also all attack and defense systems capable of resolving strategic tasks regardless of their equipment." The Russian leader underlined that Moscow is always open to broad international cooperation.

Source: Leah Crane, <https://tass.com/politics/1281579>, 22 April 2021.

NUCLEAR PROLIFERATION

IRAN

Iran Says 60% Uranium Enrichment Response to Israel's 'Nuclear Terrorism'

Iran's President Hassan Rouhani said...Tehran's decision to boost uranium enrichment to 60 percent was a response to Israel's "nuclear terrorism," three days after an attack on its Natanz nuclear facility. "Enabling IR-6 (centrifuges) at Natanz, or bringing enrichment to 60 percent: this is the response to your malice," Rouhani said in televised remarks. "What you did was nuclear terrorism. What we do is legal." The new move casts a cloud over talks in Vienna aimed at reviving Iran's 2015 nuclear deal with major powers, after former US President Trump abandoned it three years ago. Enriching uranium to 60 percent from Iran's current 20 percent would take the fissile material closer to the 90 percent required to make a nuclear bomb. Iran's chief nuclear negotiator Abbas Araqchi also said it would activate 1,000 advanced centrifuge machines at Natanz, which was crippled an explosion that knocked out its power supply. Israel's Mossad spy agency is thought to have been behind the attack.

The new move casts a cloud over talks in Vienna aimed at reviving Iran's 2015 nuclear deal with major powers, after former US President Trump abandoned it three years ago.

The blast at the underground Natanz plant was a "very bad gamble" that would boost Tehran's leverage in the talks to salvage the nuclear deal, which resume... in Vienna, Iranian Foreign Minister Mohammad Javad Zarif said. "I assure you that in the near future more advanced uranium enrichment centrifuges will be placed in the Natanz facility," he said.

Source: <https://www.arabnews.com/node/1842251/middle-east>, 14 April 2021.

Nuclear Talks are Progressing, Iran and U.S. Say, Despite Tehran's Enrichment Threats

Talks on the Iranian nuclear deal in Vienna hit more positive notes on 19 April, 2021, officials said, as Tehran and Washington continue indirect

negotiations in the hope of reviving the 2015 accord that lifted economic sanctions on Iran in exchange for curbs to its nuclear program. "We are on the right track and some progress has been made, but this does not mean that the talks in Vienna have reached the final stage," Iranian Foreign Ministry spokesman Saeed Khatibzadeh told a news conference in Tehran.

Iran Boosting Uranium Enrichment: U.S. officials say there has been no

breakthrough, but have described the indirect discussions as "thorough" and "thoughtful." Reports say diplomats may even draft an interim deal that would give all sides more time to resolve some of the more complicated technical issues. Negotiations are starting to pick up pace, even as Iran announces further violations of the deal — most significantly its pledge to begin enriching uranium to 60% purity, which would bring the fissile material closer to levels required for a bomb. Uranium enrichment needs to be at 90% in order to make a bomb — the limit under the 2015 deal was 3.67%. The move are "violations Iran is trying to turn into leverage at the negotiations in Vienna," Behnam Ben Taleblu, a senior fellow at the Foundation for Defense of Democracies, told CNBC.

While this move is aimed at strengthening Tehran's hand, it could also backfire, analysts warn. Iran on April 10 launched advanced centrifuges for enriching uranium to mark its national "Nuclear Day" while its President Hassan Rouhani reiterated the country's commitment to nuclear non-proliferation. The conflicting messages on state television were followed by an explosion at Iran's Natanz enrichment facility just one day later — which Tehran has called an

"act of nuclear terrorism" and blamed on Israel. Israel publicly declined to confirm or deny any responsibility.

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new enrichment push by Tehran.

Throughout the talks Iranian officials have essentially taken a hard-line approach — they want Washington to lift all sanctions before it returns to compliance. The Biden team has expressed willingness to remove all sanctions that are inconsistent with the accord, but it hasn't

Throughout the talks Iranian officials have essentially taken a hard-line approach — they want Washington to lift all sanctions before it returns to compliance. The Biden team has expressed willingness to remove all sanctions that are inconsistent with the accord, but it hasn't exactly spelled out what that means yet.

...Still, all parties continue to seek a U.S. return to the deal that the former Trump administration abandoned in 2018, after which it imposed crippling sanctions on Iran's economy. The U.S. also wants to see Iran return to full compliance before it lifts sanctions, something that gets trickier with each

exactly spelled out what that means yet. Officials on all sides have described a mutual desire to move toward simultaneous and sequential steps to get this deal over the line. But at this point, there is still significantly more work to be done.

At same time, the IAEA has started separate talks with Iran on uranium traces that the agency found at undeclared locations in the country. The agency wants to understand where the traces came from and ensure that Iran is not diverting the material to make a nuclear weapon, which would mark a major blow to the apparent progress of the talks so far. Iran is insisting that that is not the case. The EU's top diplomat Josep Borrell said, "I think that both parties are really interested in reaching an agreement, and they have been moving from general to more focused issues, which are clearly, on one side sanction-lifting, and on the other side, nuclear implementation issues." ...

Source: *Natasha Turak, <https://www.cnn.com/2021/04/20/nuclear-deal-talks-are-making-progress-iran-and-us-say.html>, 20 April 2021.*

UKRAINE

Ukraine may Seek Nuclear Weapons if Left out of NATO: Diplomat

A Ukrainian diplomat has reportedly warned Kyiv may be forced to acquire nuclear weapons to safeguard the country's security if NATO does not accede to its membership demand amid spiralling tensions with neighbouring Russia. Andriy Melnyk, Ukraine's ambassador to Germany, suggested to national public radio network Deutschlandfunk on 15 April 2021 that President Volodymyr Zelensky's administration was weighing up all possible options as fears mount over a possible escalation of hostilities in the country's conflict-stricken east.

"Either we are part of an alliance like NATO and also make our contribution to strengthen this Europe, or we have only one option; to rearm ourselves," Germany's DPA news agency quoted Melnyk as saying. "How else could we guarantee our defence?" His comments came after intensified fighting in recent weeks in Ukraine's Donetsk and Luhansk regions, where government forces have battled Russian-backed separatists since the rebels seized a swath of territory there in April 2014. Meanwhile, Russia has amassed tens of thousands of troops as well as tanks and artillery near the shared border in the region. Moscow has also mobilised troops in the annexed Black Sea region of Crimea, which it annexed from Ukraine in March 2014.

Kyiv's NATO Push: Ukraine is currently an ally of NATO, but not a member. It has sought to launch accession talks for years but has consistently been turned down. The issue has acquired renewed urgency of late as a result of the stand-off with Moscow. Earlier this month, Kyiv called for its entry into the alliance to be fast-tracked, saying

it was the only way to end the conflict in the Donbas region, of which Donetsk and Luhansk are a part.

Moscow opposes Kyiv's ascension bid and has accused NATO and leading member the US of turning Ukraine into a "powder keg" with increasing arms supplies to the country. NATO, meanwhile, has told Ukraine to roll out domestic reforms and develop its defence capabilities in order to be considered for membership. While a ceasefire halted full-scale warfare in Donbas in 2015, sporadic clashes never ceased Zelensky said that he had again raised the issue of Ukraine's NATO membership bid while attending talks with French President Emmanuel Macron in Paris.

German Chancellor Angela Merkel also joined the discussions in the French capital via video link. The Ukrainian President told reporters following the meeting that he felt supported by France and Germany, both of which are NATO members, with

regards to his country's action plan for joining the alliance. He also said he was ready to hold four-way talks that included Russian President Vladimir Putin to calm relations with its neighbour, adding that he thought a separate meeting between US President Joe Biden and Putin proposed by Washington could help solve some issues.

Source: *<https://www.aljazeera.com/news/2021/4/16/ukraine-may-seek-nuclear-weapons-if-left-out-of-nato-diplomat>, 16 April 2021.*

SAUDI ARABIA

US Lawmakers Introduce Bill to Stop Saudi Arabia from Obtaining Nuclear Weapons

A group of US lawmakers have introduced legislation that seeks to stop the possibility of Saudi Arabia obtaining a nuclear weapon, after reports surfaced in 2020 that China had secretly assisted Riyadh to expand its nuclear programme. The bill, titled, The Saudi WMD Act, aims to "take steps to impede access to sensitive

A Ukrainian diplomat has reportedly warned Kyiv may be forced to acquire nuclear weapons to safeguard the country's security if NATO does not accede to its membership demand amid spiralling tensions with neighbouring Russia.

technologies that could pave the way to Saudi Arabia acquiring a nuclear weapon," according to a press release announcing the legislation on 15 April, 2021. It was introduced in the Senate by senators Ed Markey and Jeff Merkley, and introduced in the House of Representatives by congressmen Ted Lieu and Joaquin Castro.

"Nuclear weapons in the hands of terrorists and rogue regimes is one of the gravest threats to the security of the American people and to our partners around the world," Merkley said in a statement. "If

Saudi Arabia is working to undermine the global non-proliferation and arms control regime, with the help of China or anybody else, the US must respond." Markey said the bill "requires greater transparency into Saudi Arabia's efforts to build out a ballistic missile and civilian nuclear program".

If passed, the measure would require the Biden administration to determine whether any foreign person or country has transferred or exported to Saudi Arabia a Category One item under the MTCR, an informal political understanding that aims to limit the amount of missile proliferation worldwide. A

Category One item would include unmanned aerial vehicle systems such as ballistic missiles, cruise missiles, and target drones that are capable of delivering a payload of at least 500kg to a range of at least 300km. If such an entity is found, the bill would require the White House to sanction them. The bill would also terminate "most US arms sales to Saudi Arabia" if it was found that the kingdom received help in building a nuclear fuel

cycle facility not under the standards set by the IAEA. Saudi Arabia has not signed up to the same restrictions to nuclear proliferation that other

countries have, and the country has only a limited safeguards agreement with the IAEA.

Saudi Nuclear Projects: For years, Saudi Arabia has been trying to diversify its energy pool so that it can export more of its oil, rather than selling it domestically at subsidised prices. Riyadh signed deals with Beijing in 2012 and 2017 for cooperation on a number of nuclear energy projects, and the kingdom has been

working on its first two commercial nuclear reactors, which will total 2.8 gigawatts. The increasing nuclear partnerships between the two countries have been a cause of concern for the US. In August 2020, American intelligence agencies had been assessing reports that China

is secretly helping Saudi Arabia expand its nuclear programme. The agencies analysed suspected collaboration between the two countries at an undeclared site in the kingdom, close to a solar-panel production area.

The Wall Street Journal also reported in 2020 that another undisclosed site in the country's northwest was

being used to extract uranium yellowcake from uranium ore, a further step towards the development of nuclear fuel that could put the kingdom on a path to developing nuclear weapons. A month later, the *Guardian* reported that Saudi Arabia likely has enough mineable uranium ore reserves to pave the way for the domestic production of nuclear fuel, citing a confidential report by Chinese

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The *Guardian* reported that Saudi Arabia likely has enough mineable uranium ore reserves to pave the way for the domestic production of nuclear fuel, citing a confidential report by Chinese geologists. In 2018, Saudi Crown Prince Mohammed bin Salman said that the country has no plans to pursue a nuclear bomb, but if Iran were to develop one, then it would follow suit "as soon as possible".

geologists. In 2018, Saudi Crown Prince Mohammed bin Salman said that the country has no plans to pursue a nuclear bomb, but if Iran were to develop one, then it would follow suit "as soon as possible". Under the previous Donald Trump administration, the US had given several authorisations to American companies to share sensitive nuclear power information.

Source: <https://www.middleeasteye.net/news/us-lawmakers-introduce-bill-stop-saudi-arabia-obtaining-nuclear-weapons>, 16 April 2021.

NUCLEAR SAFETY

UK

UK's NDA Launches New Nuclear Transport Division

A new specialist nuclear transport organisation has officially launched on 18 April, 2021, in the UK. Nuclear Transport Solutions (NTS), part of the Nuclear Decommissioning Authority (NDA), operates Direct Rail Services (DRS) and Pacific Nuclear Transport Limited (PNTL), which offer rail and shipping services, respectively. The NDA is also in the process of integrating its radioactive waste management businesses.

In February 2020, the NDA announced its decision to create a single nuclear transport division, bringing together its transport expertise and capabilities across the NDA group to support its mission to clean up the UK's earliest nuclear sites. Nuclear Transport Solutions started operating as a single organisation on 1 February. NTS has officially been fully launched on 18 April, 2021. With a workforce of over 700, it specialises in the operational, commercial, engineering, legal, and regulatory expertise that underpin nuclear transport and logistics operations. It also provides consultancy services offering bespoke solutions to customers' complex nuclear transport challenges, and transport services for customers outside of the nuclear sector.

NTS's primary objective will be to support the NDA mission through a range of activities including transporting used advanced gas-cooled reactor fuel from UK power plants to Sellafield, moving irradiated fuels from Dounreay, returning reprocessing products to customers overseas, and packaging and licensing support to the NDA group. DRS operates a fleet of over 100 locomotives. Since DRS was established in 1995, it has transported nuclear material over 5 million miles by rail in the UK. PNTL operates three specialist nuclear transport ships. So far it has shipped over 2000 nuclear casks some 5 million miles to countries including: Belgium, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Portugal, Sweden, Switzerland and the USA. ...

In November 2020, the NDA launched its integrated waste management programme to act

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as a focal point for managing the UK's radioactive waste and to deliver its integrated waste management strategy. The programme operates across the waste lifecycle, including the treatment, packaging, storage, transport and disposal of waste. The NDA said it

intends to create a single waste division to bring together its group-wide waste management expertise enabling it to grow capability, simplify how it operates and deliver greater value for the taxpayer. The new waste division will include its waste disposal companies LLW Repository Limited and Radioactive Waste Management.

Source: <https://www.world-nuclear-news.org/Articles/UKs-NDA-launches-new-nuclear-transport-division>, 19 April 2021.

UKRAINE

Ukrainian PM, IAEA Director General Discuss Issues of Nuclear Safety

Ukraine has developed a strategy for the transition to renewable energy sources, which focuses on the development of nuclear energy in

Ukraine, Prime Minister of Ukraine Denys Shmyhal said at a meeting with IAEA Director General Rafael Mariano Grossi. "Ukraine has developed a strategy for the transition to renewable energy sources. At the same time, the document focuses on the development of nuclear energy in Ukraine," Shmyhal said, Ukrinform reports with reference to the Government portal. He also stressed that nuclear energy is the basis of Ukraine's energy system.

"Our nuclear energy sector operates in accordance with national and international standards and IAEA requirements for ensuring nuclear and radiation safety. At the same time, Ukraine demonstrates the reliability and transparency of the existing system of control over nuclear materials" the prime minister said.

Shmyhal informed the IAEA director general that in 2023 the Ukrainian energy system would be synchronized with the European ENTSO-E network, which will contribute to the further development of the nuclear energy sector in Ukraine. In addition, the interlocutors discussed overcoming the consequences of the Chernobyl NPP disaster.

The prime minister said that a license was issued for the operation of a dry storage facility for used nuclear fuel (SNFS-2) of the Chornobyl NPP, which will allow moving nuclear fuel from the SNFS-1 storage facility, built during the liquidation of the accident in 1986. Shmyhal thanked the IAEA for the assistance in overcoming the consequences of the Chornobyl disaster as well as in transforming the facility into an environmentally friendly system. The IAEA is an international intergovernmental scientific and

technical organization, with 172 member states.

Source: <https://www.ukrinform.net/rubric-economy/3235633-ukrainian-pm-iaea-director-general-discuss-issues-of-nuclear-safety.html>, 27 April 2021.

NUCLEAR WASTE MANAGEMENT

JAPAN

IAEA Ready to Support Japan on Fukushima Water Disposal, Director General Grossi Says

Our nuclear energy sector operates in accordance with national and international standards and IAEA requirements for ensuring nuclear and radiation safety. At the same time, Ukraine demonstrates the reliability and transparency of the existing system of control over nuclear materials.

Director General Rafael Mariano Grossi welcomed Japan's announcement that it has decided how to dispose of treated water stored at the Fukushima Daiichi Nuclear Power Station and he said the IAEA stands ready to provide technical support in

monitoring and reviewing the plan's safe and transparent implementation.

Japan's chosen water disposal method is both technically feasible and in line with international practice, IAEA Director General Grossi said. Controlled water discharges into the sea are routinely used by operating nuclear power plants in the world and in the region under specific regulatory authorisations based on safety and environmental impact assessments. "Today's

decision by the Government of Japan is a milestone that will help pave the way for continued progress in the decommissioning of the Fukushima Daiichi nuclear power plant," Mr Grossi said. "Tanks with the water occupy large areas of the site, and water

Nuclear safety is a national responsibility and it was for the Government of Japan to decide how to address the critical issue of water management. I'm confident that the Government will continue to interact with all parties in a transparent and open way as it works to implement today's decision.

management, including the disposal of the treated water in a safe and transparent manner involving all stakeholders, is of key importance for the sustainability of these decommissioning activities."

He added: "The Japanese Government's decision is in line with practice globally, even though the large amount of water at the Fukushima plant makes it a unique and complex case." "Nuclear safety is a national responsibility and it was for the Government of Japan to decide how to address the critical issue of water management. I'm confident that the Government will continue to interact with all parties in a transparent and open way as it works to implement today's decision" Director General Grossi said.

Japan has requested the IAEA's cooperation in the disposal of the water by the IAEA dispatching international expert missions to review the country's plans and activities against IAEA safety standards and supporting and being present at environmental monitoring operations there. ...The IAEA and Japan have been cooperating extensively over the past decade to deal with the aftermath of the Fukushima Daiichi accident, in areas such

as radiation monitoring, remediation, waste management and decommissioning.

Since the Director General took office in December 2019, he has offered IAEA support related to the Fukushima water issue in meetings with senior Japanese officials, including then Prime Minister Shinzo Abe during an official visit to the country in February 2020. In March, 2021, he held a virtual meeting with Minister of Economy, Trade and Industry Hiroshi Kajiyama. The IAEA's safety reviews, and other technical support, are based on its safety standards, which constitute the worldwide reference for protecting the public and the environment from harmful effects of ionizing radiation.

Source: <https://www.iaea.org/newscenter/pressreleases/iaea-ready-to-support-japan-on-fukushima-water-disposal-director-general-grossi-says>, 13 April 2021.



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