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**OPINION – Manpreet Sethi**

**Disarming the Unarmed: Current Reality of Nuclear Ban Treaty**

Honduras became the 50th country to ratify the Treaty on the Prohibition of Nuclear Weapons (TPNW) on 24 October 2020. Ninety days from that date, the ban treaty, as it is popularly called, will enter into force. At a time when arms control treaties are falling by the wayside, this should have been a heartening move. However, despite the landmark event, TPNW is unlikely to achieve its goal of ushering in a nuclear weapons free world (NFWF). While it valiantly outlaws the development, testing, production, manufacture, acquisition, transfer, possession, stockpiling and use or threat of use of nuclear weapons, it presently bans the bomb for those who do not have it!

The current 50 ratifications and 84 signatures for TPNW come from countries that do not possess nuclear weapons. The nine nuclear weapons possessors (NWP) and NATO states have rejected the treaty. At the time of its conclusion, US, UK and France had said they do not “intend to sign, ratify, or ever become party to it”. China, Russia, and the four non-NPT countries fault it for lack of definitions, verification and compliance processes.

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So, as far as the NWPs are concerned, nothing will change after 22 January 2021 when the treaty becomes operative. Each of them remains wedded to nuclear deterrence and engaged in upgrading its nuclear arsenal. In fact, it was their unwillingness to change course that led some frustrated non-nuclear weapons states (NNWS) to move the UN General Assembly to mandate negotiations for the treaty in 2016. Two sessions were convened. Nuclear possessors refused to participate. Consequently, when the treaty was adopted by a

vote in July 2017, it revealed a deep rift between the NWP and NNWS. The treaty that had set out to stigmatize the nuclear weapon and seek its elimination had ended up stigmatizing the NWP and creating fractious camps.

Since the treaty opened for signature, supporter nations and non-governmental organisations including the Nobel Peace Prize winner ICAN, have actively and successfully worked for its entry into force. However, while the treaty will enter into force, it will not mark the exit of nuclear weapons till such time as NWP agree to action.

The focus, therefore, of the supporters of nuclear elimination should now be on trying to find ways of nudging nuclear possessors in this direction. One way of doing so would be to empathetically examine their points of opposition to the treaty. India, for instance, had raised two pertinent issues while explaining its position on TPNW in 2017. These resonate with others too and addressing them can help engage these countries.

New Delhi had rejected the treaty for two main reasons. First, because it was not negotiated in the right forum or in the right manner. India believes that the appropriate forum for negotiating complex dimensions of nuclear elimination is the Conference on Disarmament, a UN body comprising 65 nations, that follows consensus-based decision making. India considers it critical to take all stakeholders along on this subject. Not doing so could result in an outcome unacceptable to key players, as seems to have happened with the TPNW.

India's second criticism has been on lack of attention to issues of verification and compliance.

The treaty exhorts NWP to join by removing nuclear weapons "from operational status immediately and to destroy them in accordance with a legally binding, time-bound plan..." However, these terminologies are not defined. Nor does the treaty establish who would monitor and certify progress of elimination as per schedule, or how non-compliance would be addressed. With such fundamental questions left unanswered, India found

the treaty insufficient to promote real disarmament.

Given the current high trust deficits amongst multiple adversarial nuclear dyads, it would be impractical to expect nuclear elimination unless a verification regime was woven in. But to do so will require not only innovative technologies but also inclusive political negotiations. Festering divisions would be counter-productive. Consensus building through small, doable measures has to be the key.

Movement towards nuclear elimination may best be started through steps that seek to reduce the salience of nuclear weapons. Human nature rebels against giving up anything to which it attaches value. So, by reducing the worth of nuclear weapons, nations may be persuaded to eliminate their arsenals. Such value reduction may be possible by encouraging doctrines that constrict the role of nuclear weapons to nuclear deterrence alone; by showcasing the military futility of use of such weapons; by universalising no first use; or, by first prohibiting the use or threat of use of nuclear weapons. As weapons fall into disuse as a result of these measures, their elimination will become possible.

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Interestingly, India's nuclear doctrine is a practitioner of these measures. It shows how deterrence can be effectively maintained while keeping a narrow role for nuclear weapons, building low numbers, and severely restricting circumstances of employment to retaliation only. Through such a doctrine, India has managed to simultaneously deter both a conventionally weaker and stronger nation. Therefore, its practice of nuclear deterrence is a practical demonstration that if adopted by others could set us towards an NWFV.

The occasion of entry into force of the TPNW can be best utilised to give serious thought to steps that help attain its deeper objective. This would be in the interest of all states—nuclear and non-nuclear.

*Source: Sunday Guardian Live, <https://www.sundayguardianlive.com/opinion/disarming-unarmed-current-reality-nuclear-ban-treaty>, 31 October 2020.*

**OPINION – Heather Williams**

**What the Nuclear Ban Treaty Means for America's Allies**

On Oct. 24, 2020, Honduras ratified the Treaty on the Prohibition of Nuclear Weapons, also known as the "nuclear ban treaty," becoming its 50th member. This sets in motion a 90-day countdown for the treaty's entry into force. Notably, not a single state that possesses nuclear weapons has signed or ratified the treaty.

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**The Treaty on the Prohibition of Nuclear Weapons was concluded in July 2017 with the support of 122 countries. It opened for signatures a few months later. Members include historical leaders in nuclear disarmament efforts, such as Mexico, Ireland, and New Zealand, along with states that have suffered because of nuclear testing, such as Fiji and Samoa.**

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This means that states cannot have any direct involvement in practices that support the continued possession or "threat to use" nuclear weapons. This has clear implications for the United States and for NATO, a military alliance that falls under the U.S. nuclear umbrella and continues to rely on nuclear deterrence.

Whether or not the treaty delivers on its disarmament promises or has a major impact on U.S. or NATO nuclear postures ultimately depends on what its members and supporters do next and if it can prove that it is more than just a symbolic protest against the nuclear status quo.

... At present, membership is too great a risk for America's allies until the treaty proves whether it improves or undermines members' security and addresses concerns regarding its credibility. What is the Logic of a Treaty Banning Nuclear Weapons?: The Treaty on the Prohibition of Nuclear Weapons was concluded in July 2017 with the support of 122 countries. It opened for signatures a few months later. Members include historical leaders in nuclear disarmament efforts, such as Mexico, Ireland, and New Zealand, along with states that have suffered because of nuclear testing, such as Fiji and Samoa. Since then, it has accumulated signatures, with Honduran ratification marking the beginning of the treaty's entry into force.



At least two major factors contributed to the evolution of the treaty. First, states are disappointed with the lack of progress towards nuclear disarmament within more traditional forums, such as the NPT and the Conference on Disarmament. In the lead-up to the treaty's negotiation, over 100 states participated in a series of three conferences on the humanitarian impacts of nuclear weapons. These conferences included testimony from the hibakusha, survivors of the nuclear bombings of Hiroshima and Nagasaki, along with research on "nuclear winter" and risks of nuclear weapons use. For many participants, the humanitarian conferences were meant to reframe the moral acceptability of nuclear weapons as part of a process towards their ultimate elimination, similar to the process for banning anti-personnel land mines and cluster munitions.

Second, civil society lobbied hard for this treaty, particularly through the International Campaign to Abolish Nuclear Weapons, a consortium of non-governmental organizations, which won the Nobel Peace Prize in 2017. Civil society lobbied governments and launched campaigns such as Don't Bank on the Bomb and the Cities Appeal, which has been signed by the mayors of Washington, D.C., and Paris, calling on their national governments to join the nuclear ban treaty. In her Nobel Peace Prize acceptance speech, Beatrice Fihn — the director of the International Campaign to Abolish Nuclear Weapons — appealed directly to America's allies: "To the nations who believe they are sheltered under the umbrella of nuclear weapons, will you be complicit in your own destruction and the destruction of others in your name?" The expanding profile of the nuclear ban treaty is largely due to the work of civil societies, which have targeted U.S. allies in their effort to bring the treaty into effect.

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From the outset, the United States and other nuclear weapons possessors have been opposed to the idea of a nuclear weapons ban. In 2014, Under Secretary of State for Arms Control and International Security Rose Gottemoeller stated explicitly that "[t]he United States cannot and will not support" calls for the negotiation of a nuclear weapons ban treaty. The five nuclear-armed states recognized by the NPT have also consistently

opposed the nuclear ban treaty and argued it cannot be a substitute for the NPT.

Critics argue that the nuclear ban treaty is not a viable tool for nuclear disarmament because it does not have a robust verification regime and because it might

undermine existing disarmament and nonproliferation efforts, such as the NPT. An additional criticism is that the nuclear ban treaty will be unable to achieve its aim of establishing a new legal norm against nuclear weapons, similar to what exists for biological and chemical weapons, because it does not include a critical mass of states, including those that actually possess nuclear weapons. By focusing on the

weapons rather than the security environment, it ignores the dynamics that drive states to rely on nuclear weapons in the first place.

So if the United States isn't likely to join the nuclear ban treaty, why should American

policymakers and experts care about its entry into force? In short, because NATO members are concerned with the issue of disarmament and might be tempted to join the treaty over time. This would have significant ramifications for the U.S. nuclear mission and could potentially polarize NATO.

Can a NATO Member Join the Nuclear Ban Treaty?: The treaty's supporters have consistently targeted America's European allies to withdraw from

NATO's nuclear mission. Thus far, their efforts have failed: NATO remains steadfast in its commitment to nuclear deterrence, supported by the strategic nuclear arsenals of France, the United Kingdom, and the United States, as well as U.S. nuclear weapons forward deployed in Europe.

However, from the perspective of America's European allies, there could be some benefits to nuclear ban treaty membership. European governments are under pressure from a portion of the public that supports nuclear disarmament. Membership in the treaty would be a symbolic commitment to "general and complete disarmament," as mandated in Article VI of the Nuclear Non-Proliferation Treaty. In a recent letter, 56 former leaders of NATO countries argued that the ban treaty can "help end decades of paralysis in disarmament." Finally, allies would potentially claim some international moral leadership on humanitarian grounds by distancing themselves from the most destructive weapons on earth.

But treaty membership would come at a cost to national security. If a NATO ally were to join the nuclear ban treaty, this means they would have to renounce the threat to use nuclear weapons on their behalf — the "nuclear umbrella" — and cease to support NATO's nuclear mission. More importantly, five NATO members directly support the U.S. nuclear mission through the basing of dual-capable aircraft, which could constitute the possession, receiving, threatening to use, stationing, installation, or deploying nuclear weapons.

At present, membership in NATO and the nuclear ban treaty seem mutually exclusive. According to Brad Roberts, a nuclear policy expert at Lawrence Livermore National Laboratory, "At least three times over the last decade NATO heads of state

or government have unanimously endorsed a continued role for nuclear weapons in the alliance's deterrence and defense posture." A recent NATO information sheet stated that the nuclear ban treaty "is inconsistent with the Alliance's nuclear deterrence policy, and will not enhance any country's security." "As long as nuclear weapons exist," went the most recent 2019 declaration, "NATO will remain a nuclear alliance."

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A united front is crucial: If a single NATO member were to join the treaty, it could have serious repercussions for the entire alliance. For example, were the Netherlands to join the nuclear ban treaty, it would be forced to end its direct support to NATO's nuclear mission. That mission was declared "a crucial part of NATO deterrence and defence" by the Dutch government's independent advisory council in 2019. Additionally, the Netherlands would likely have to refrain from participation in any nuclear-related exercises and signing any joint statements that threaten to use nuclear weapons. This would either leave the Netherlands as an outlier within NATO or force it to withdraw from the alliance altogether. Such a scenario would not only undermine Dutch security, but also European stability and the unity of NATO.

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Many of the treaty's advocates argue that NATO members can join the treaty with "only an incremental reduction of the salience of nuclear weapons in its security doctrine." According to this line of argument, "threat to use" or possession does not necessarily equate to deterrence. Israel is an example of a state that practices deterrence, but without ever explicitly acknowledging possession of nuclear weapons or threatening to use them. Nuclear latency or ambiguity, therefore, might be possible without violating the nuclear

ban treaty. While this might prompt a nuanced legal debate, pointing to a nuclear possessor like Israel as an exemplar for how NATO members might justify nuclear ban treaty membership is specious. Arguments that policies of deterrence do not constitute the “threat to use” nuclear weapons misrepresents deterrence, and suggests a lack of seriousness on the part of the treaty’s supporters to achieve their aim “to completely eliminate such weapons.”

Treaty advocates also argue that NATO members can join the nuclear ban treaty — however, NATO as an alliance would have to change in response. This would have implications for NATO’s nuclear posture, including a rejection of nuclear deterrence, and “in particular for hosting nuclear weapons on national territories and participating in nuclear planning.” In practice, it would be up to nuclear ban treaty members to ensure compliance with the treaty and NATO members to ensure their security. This seems highly unlikely given NATO’s consistent and united messaging on the role of nuclear weapons in European security. A major study by Sweden, a NATO partner, rejected membership on the grounds that it could damage the country’s security and relationship with NATO.

What is Next for the Nuclear Ban Treaty?: Whether or not a NATO member joins the nuclear ban treaty ultimately depends on whether or not the two memberships are compatible. Compatibility will have to be determined by both nuclear ban treaty and NATO members. But it also depends on whether treaty membership is worth the potential security risks of abandoning nuclear deterrence.

By joining the nuclear ban treaty, NATO members would be giving up extended nuclear deterrence, potentially jeopardizing the unity of one of the world’s most successful cooperative security organizations. States aren’t going to take such a major step unless they believe that the alternative is somehow more secure. The ban treaty needs

to address at least four major questions to prove it is a credible and practical pathway towards nuclear disarmament.

First, how will the treaty address questions of compliance? In addition to numerous concerns raised about the treaty’s verification measures, two cases are worth mentioning here. Kazakhstan hosts a site at Sary-Shagan to test Russian reentry vehicles, which are capable of carrying nuclear weapons. This arguably counts as “assistance” towards development and possession of nuclear weapons, depending on the interpretation of nuclear ban treaty members, and would be in violation of the treaty. Similarly, Palau is a treaty member and part of the Compact of Free Association with the United States. According to the terms of the agreement:

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[The] Government of the United States has the right to operate nuclear capable or nuclear propelled vessels and aircraft within the jurisdiction of Palau without either confirming or denying the presence or absence of such weapons within the jurisdiction of Palau. Both

of these cases should raise questions among ban treaty members regarding the compliance of all member states. How the treaty addresses them will be a test of its credibility and seriousness.

Second, will the treaty supporters target all nuclear possessors or continue to focus on Western democracies? Thus far, treaty supporters, particularly civil society organizations, have focused their attention on nuclear-armed democracies, such as France, the United Kingdom, and the United States, as well as other NATO members. While this is understandable from a campaigning perspective (civil society isn’t as active in Beijing or Pyongyang as it is in Washington), now that the treaty will enter into force, its members should focus on all nuclear weapons possessors, rather than those that are just more transparent.

Third, what is its relationship with the NPT? Members of the nuclear ban treaty state their full support for the NPT.

The International Campaign to Abolish Nuclear Weapons does not want any states to withdraw from it. But some supporters have begun to suggest that states should consider abandoning the NPT for the ban treaty on the grounds that, “the NPT became the cornerstone of a severely hypocritical nuclear order.” If members of the nuclear ban treaty remain committed to the NPT and want the two treaties to be separate, they can take concrete steps to make this a reality. The nuclear ban treaty could, for example, require all its members to also be members in good standing of the NPT, which is not in the current ban treaty text.

Finally, who will pay for the operation of the nuclear ban treaty? Article Nine of the treaty stipulates that members and observers are responsible for covering meeting, implementation, and verification costs. This includes costs incurred by the United Nations, such as circulating the treaty’s materials. For many countries, these are not insignificant costs. At present, 16 of the nuclear ban treaty’s 50 members are behind on their U.N. dues, and of the four countries that have lost voting rights in the United Nations due to payment arrears, one is a treaty member and two are signatories. These dues can range from tens of thousands to tens of millions of dollars, though nuclear ban treaty dues would likely be much lower. However, this is still a practical consideration in estimating the treaty’s effectiveness and will undoubtedly influence the longevity of the treaty and its ability to fulfill its mandate.

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At present, the risks of joining the Treaty on the Prohibition of Nuclear Weapons seemingly outweigh its potential benefits for NATO members, and NATO members remain committed to maintaining a nuclear alliance. The impact and longevity of the treaty will ultimately depend on how its members and supporters address numerous questions about its implementation, including those raised here — alignment with NATO

membership, compliance, universality, relationship with the Nuclear Non-Proliferation Treaty, and practical concerns around member dues and convening. These are hefty questions for the first meeting of states parties of the nuclear ban treaty.

While the treaty works through these issues, the United States cannot afford to ignore it. Rather, the United States should engage with allies, listen to their concerns about nuclear risks and disarmament, and pursue opportunities for cooperation on nuclear risk reduction. The Creating an Environment for Nuclear Disarmament initiative is one such opportunity under

**The argument that the TPNW would exacerbate political tensions on disarmament by “creating divisions” conveniently overlooks that it was actually the NPT that formally instituted the division of the world between possessors and non-possessors of nuclear weapons in the first place.**

the leadership of the six co-chairs — the Netherlands, Morocco, South Korea, United States, Germany, and Finland. It should not treat deterrence and disarmament as mutually exclusive endeavors. Providing a strong extended deterrent to allies while also being sensitive to disarmament pressures is indeed a delicate balance, but it is one that the United States has to pursue with greater nuance.

*Source: War on the Rocks, <https://warontherocks.com/2020/11/what-the-nuclear-ban-treaty-means-for-americas-allies/>, 05 November 2020.*



OPINION – John Rossomando

**Russian Battlefield Nuclear Weapons: A Threat the U.S. Military can't Ignore**

Russian military doctrine allows the use of tactical nuclear weapons in battlefield engagements with American and allied armed forces. A Congressional Research Service report from January estimated that Russia has 1,830 tactical nuclear weapons in its arsenal.

“The Russian Federation reserves the right to use nuclear weapons in response to the use of nuclear and other types of weapons of mass destruction against it and/or its allies, as well as in the event of aggression against the Russian Federation with the use of conventional weapons when the very existence of the state is in jeopardy,” Vladimir Putin wrote in his June executive order on Russian nuclear doctrine. This has U.S. officials worried that Russia would use such nuclear weapons in a conventional conflict to compensate for the inferiority of its conventional forces to their U.S. and NATO counterparts.

Former Soviet president Mikhail Gorbachev committed to the elimination of tactical nuclear weapons before the Soviet Union collapsed in 1991. Nevertheless, Russia under Putin has balked at the idea of following through with their elimination and has been unwilling to include tactical nuclear weapons in the next START treaty. Reducing the threat from Russian tactical or battlefield nuclear weapons to US troops in the event of a war with Russia stands among the top of President Donald Trump's priorities.... The president's team unsuccessfully pressed hard against Russian negotiators to

include tactical nuclear weapons in the next iteration of the START.

However, former Vice President Joe Biden has not endorsed including tactical nuclear weapons in the next iteration of the START treaty. Biden has indicated a willingness to extend the current START Treaty; however, he has not indicated any preconditions such as the inclusion of Russian tactical nuclear weapons or roping China into a tripartite agreement.

The current START treaty that Biden helped draft in 2010 expires in February. Putin isn't Gorbachev. He's a tough operator who only understands reciprocal pressure and force. He will pocket whatever concessions he is given. Russia has modernized its tactical nuclear program, which is not covered under the START treaty, and the U.S. must modernize its land-based deterrent to increase pressure on the Russians to settle.

Russia deployed “short- and close-range ballistic missiles, ground-launched cruise missiles, including the 9M729 missile, which the U.S. Government determined violates the Intermediate-Range Nuclear Forces or INF Treaty, as well as anti-ship and anti-submarine missiles, torpedoes, and depth charges,” Lt. Gen. Robert P. Ashley, former director of the Defense Intelligence Agency, said during remarks at the Hudson Institute in Washington in May 2020.

In contrast, the United States only has a single non-strategic nuclear weapon: the B-61 gravity bomb. The president's opponents have cast him as a Russian tool, but the demand that Russia cast aside the use of battlefield nuclear weapons is an example of where he is tougher on Russia than the Obama-Biden administration was.

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Should President Trump prevail in the election, his administration should press ahead with the modernization of U.S. nuclear weapons and with the Ground-Based Strategic Deterrent (GBSD) program to build the next generation of ICBM, which will replace the 50-year-old Minuteman III ICBMs. The administration's budgetary request, as well as the current drafts of the House and Senate versions of the National Defense Authorization Act, all are agreed to give \$1.524 billion to the program for the 2021 fiscal year. The U.S. Air Force expects the GBSD to cost \$21.96 billion over the life of the program and is not expected to begin deployment until 2029.

Part of nuclear negotiating is keeping the Russians guessing where the threat is and where it's coming from. The nation's seaborne deterrent provides that because where its SLBM are is a closely guarded state secret. America's land-based nuclear arsenal should provide similar uncertainty for the Russians.

Russia knows that in case of war it can pinpoint land-based missile silos via its spy satellites and then strike them. During the 1980s, the Reagan administration proposed using mobile railcars and mobile launchers to keep the Soviets guessing. However, the Cold War ended and President George Bush canceled the program in 1991 before the program's slated 1993 rollout date.

President Reagan ramped up America's land-based nuclear posture with the MX "Peacekeeper" missile program, the Pershing 2 and the GLCM system. The MX program created a "shell game" that kept the Russians guessing where the missiles were. The U.S. Air Force randomly moved the missiles between shelters in the deserts of Nevada and Utah to make it difficult to know where

the actual missiles were and which one were dummies. Reagan viewed the MX as a key negotiation chip.

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just that. The Trump administration withdrew in August 2019 in the wake of Russian treaty violations.

Some of the missiles could be redeployed in Alaska to increase the pressure on the Russians due to the state's proximity to the Russian Far East. They also can be deployed in the Baltics and Poland to counter the 9K720 Iskander short-range ballistic missiles based in Russia's Kaliningrad region along the Baltic Sea.

**Modernizing America's land-based nuclear deterrent offers a substantial chip of deterrence to play to get the Russians to decommission their tactical nuclear arsenal. The next administration must compel Russia to forswear the use of tactical nuclear weapons in a conventional future conflict.**

President Trump, or Joe Biden if he is elected, should revisit the Reagan administration's proposal and make part of America's land-based ICBM and short-range nuclear deterrent mobile. It announced last year plans to revive the Reagan-era GLCM program, which was scrapped under the 1987 INF, that would do

Reagan showed at Reykjavik in 1986 that holding out combined with ratcheting up the pressure on an adversary can help produce a better deal. Sticking to his guns with Mikhail Gorbachev led to the signing of the INF in 1987 and paved the way to

the original START Treaty in 1991.

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*Source: National Interest, <https://nationalinterest.org/print/blog/buzz/russian-battlefield-nuclear-weapons-threat-us-military-cant-ignore-171739>, 31 October 2020.*

OPINION – Joshua Pollack

**Peeking Under the Shroud of North Korea’s Monster Missile**

Some unresolved questions surround the huge new mobile missiles that North Korea showed off in last month’s parade. Most of all: what will they carry, and when will the North Koreans reveal it through flight-testing?

Let’s start with what we can observe. The external characteristics of the weapon are consistent with a two-stage, liquid-propelled ICBM. In many ways, it’s similar to the Hwasong-15, which North Korea tested in 2017, but on a larger scale. My CNS colleagues estimate that the new missile is about 25 m long, compared to the roughly 20 m-long HS-15. It has a first stage of about 2.4 m in diameter, compared to the approximately 2.1 m diameter of the HS-15.

Like the HS-15, the Monster Missile features a “skirt” at the base of its first stage, suggesting a cluster of gimbaled engines, and an evocatively named “shroud” over its payload section at the front. That’s a hollow cover that pops off after the missile leaves the atmosphere, allowing whatever the missile carries to deploy.

As Mike Elleman and Vann van Diepen were quick to observe, the HS-15 already appears capable of sending a heavy payload to anyplace on the mainland of these United States. It follows that the new missile wasn’t built for greater range, but to carry a bigger, heavier payload. Which means... what?

Even before the parade, veteran intelligence analysts Markus Garlauskas and Bruce Perry noted that the logical next step for the North Korean ICBM program would be to deploy multi-warhead missiles in order to thwart U.S. missile

defenses. Ensuring that North Korea’s nuclear weapons can penetrate the American “shield” may be what Kim Jong Un meant when he said in 2017 that “our final goal is to establish the equilibrium of real force [or “effective balance of power”] with the U.S. and make the U.S. rulers dare not talk about [a] military option for the DPRK.”

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The U.S. pioneered the MRV concept in the early 1960s, followed by the MIRV. The Soviet Union caught up with their own versions within a decade or so. You could think of MRV as nuclear grapeshot, spraying a handful of bombs across

one area. MIRV is more precise and more adaptable; it involves a small rocket engine called a post-boost vehicle, or “bus,” that pushes each warhead it carries onto a selected course, sending them to different targets if desired.

Some combination of multiple warheads and missile-defense countermeasures—chaff, decoys, and so forth—has become the favorite in this morbid little guessing game. If they’re ambitious, perhaps the North Koreans might be trying to replicate Britain’s Chevaline payload, which was designed to let its Polaris missiles thwart nuclear-tipped interceptors placed around Moscow. Chevaline was a two-warhead system with a post-boost vehicle that dispensed countermeasures into various patterns in space. It’s also rather well-documented today, as these things go.

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There’s another possibility that I’ve yet to see explored at length, though. Let’s call it a dark horse. It’s another approach to beating missile defense, and one that requires a heavy payload, but no more than a single warhead per missile. That’s the fractional orbital bombardment

system (FOBS).

FOBS was a Soviet innovation, brought to fruition in the mid-1960s, before the USSR developed its own multiple-warhead missiles. It involved a modified ICBM that launched its payload into low earth orbit. When the payload approached its target, an onboard retro-rocket would fire, deorbiting the warhead.

The advantage of FOBS was its ability to circumvent NORAD's lines of early-warning radars in Canada. The FOBS weapon could be launched in any direction, allowing the USSR to launch an attack over the South Pole if desired.

Today's early-warning radars don't just provide warning; they also supply crucial data to the Ground-based Midcourse Defense (GMD). These radars are located in Alaska, Greenland, the UK, California, and Massachusetts, pointing north, west, and east, whereas the interceptors themselves are mostly in Alaska, waiting for an attack from the north. Thus, the same old FOBS concept remains applicable. It's even enjoying new life in Russia, whose president has said that the Sarmat multi-warhead missile can attack over either the North or the South Pole.

With the ability to attack in FOBS mode, North Korea could compel the United States to an unhappy choice: either build what amounts to a substantially new, south-facing defensive architecture, or accept that it cannot physically prevent nuclear attack from Pyongyang, even under the sunniest of assumptions about GMD's performance.

Even if North Korea is building a FOBS today, its leaders probably anticipate a transition to MIRV in time, following the Soviet precedent. But FOBS could have certain advantages for now. First, the technology simply might be more rapidly attainable. Second, sticking with just one warhead per missile demands less fissile material. Third, it also avoids creating pressure to return to nuclear testing to demonstrate the smaller, lighter

warheads most suited to MRV or MIRV. Fourth, being able to deorbit a payload essentially anywhere means that North Korea could finally conduct a fully realistic and instrumented test of an intercontinental-class reentry vehicle on its own territory, or close to its own shores; they'd just have to fly one all the way around the world.

There's an uncomfortably large chance that we'll find out soon what the Monster Missile hides under that shroud. A transition to a Biden administration on January 20, 2021 gives Kim Jong Un an incentive to try to demonstrate the existence of an "effective balance of power" beforehand, since it might strengthen his hand without directly challenging the newly inaugurated president. Kim has set the 8th

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Workers' Party Congress for January as well; the success of a "new strategic weapon"—either real success or merely alleged—could set the stage for changes in governing structures and the direction of policy.

Whatever does happen, I can't see any benefits from sitting back and waiting for North Korea to demonstrate the ability to overcome GMD by whatever means. That will mean bargaining for the reaffirmation of Kim Jong Un's April 2018 pledge not to test long-range missiles or nuclear devices, which he declared a dead letter in January of this year. How that will work will be up to the new team in Washington, but the sooner they decide on their approach, the better.

*Source: Arms Control Wonk Blog, <https://www.armscontrolwonk.com>, 05 November 2020.*

## **NUCLEAR STRATEGY**

### **RUSSIA**

#### **Russia is Rearming its Nuclear Missile Forces with Yars ICBMs**

In the next four years Russia will complete the rearming of its Strategic Missile Force with Yars silo-based and mobile ICBMs. The first regiment armed with Yars road-mobile ICMBs assumed

combat duty at the Teikovo missile division in central Russia in March 2011, and it was reported that the entire force is on schedule to receive the upgrade.

"I believe everything is moving towards the situation that the old grouping will be fully rearmed with Yars missile systems by 2024," Chief Designer of the Moscow Institute of Thermal Technology, the Yars developer, Yuri Solomonov, told TASS.

To date six missile divisions have been rearmed with the Yars mobile ICBMs, and according to the Russian Defense Ministry, in September the Strategic Missile Force's missile division stationed in Irkutsk in Siberia had been reequipped with the platform.

**Silo-Based Upgrade:** In addition to the road-mobile upgrades, the Russia Defense Ministry has also been installing silo-based Yars ICBMs. In particular, Russian Defense Minister Sergei Shoigu said at the ministry's conference call on October 13 that two Yars missiles had already been placed in silo launchers in the Kaluga Region in central Russia.

The RS-24 Yars is a Russian strategic missile system comprising a mobile or silo-based solid-propellant intercontinental ballistic missile with MIRVed warheads. Russia conducted a successful training launch of the platform in September 2017, which was designed to verify the reliability of the weapon.

The drill was conducted in conjunction with the Kremlin's Zapad-2017 (or West-2017) wargames in Belarus. It was the first test of the mobile Yars variant since December 2014, while the silo-based version of the Yars was also tested in September 2017. The main purpose of the launches was to

reaffirm the reliability of a batch of the same class of missiles the Defense Ministry noted following the tests.

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The RS-24 Yars was developed by the Moscow Institute of Thermal Technology under the supervision of Academician of the Russian Academy of Sciences Yuri Solomonov, who turned 75. The Yars is a modification of

the Topol-M missile system.

**Guarantor of Sovereignty:** The Kremlin has long considered its strategic nuclear deterrent as the paramount guarantor of its sovereignty. As the United States has worked on advanced missile defenses, Moscow has also stepped up its efforts to counter any perceived threat to its strategic nuclear forces—one area where Russia has been able to maintain parity with Washington.

**Currently, Russia's Strategic Missile Force operates eight types of missile systems. These include five silo-based types: Voyevoda, Stiletto, Topol-M, Yars and Avangard. The mobile grouping comprises road-mobile Topol, Topol-M and Yars ICBMs. Russia plans to gradually rearm all of its missile formations with the latest Yars, Avangard and Sarmat missile systems.**

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missile formations with the latest Yars, Avangard and Sarmat missile systems.

*Source: National Interest, <https://nationalinterest.org/print/blog/buzz/russia-rearming-its-nuclear-missile-forces-yars-icbms-171868>, 03 November 2020.*

## USA

### Biden White House Seen Revamping Strategy for Nuclear Weapons

A Joe Biden administration would re-examine the U.S. nuclear strategy and arsenal, the Democratic



chairman of the House Armed Services Committee says. Rep. Adam Smith (D-Wash.), who's questioned and criticized the need to boost the nuclear arsenal, said he's "quite confident," a new administration would reassess plans.

Boosting and overhauling nuclear weapons has been an issue that has split—sometimes acrimoniously—Democrats and Republicans on the Armed Services panel. Current plans call for modernizing the capacity to deliver nuclear weapons via land-based missile systems, nuclear submarines, and strategic bombers—the "nuclear triad." The Congressional Budget Office estimates such an effort could cost as much as \$1.2 trillion through 2046 for development, purchasing and long-term support.

Rep. Adam Smith (D-Wash.), chairman of the House Armed Services Committee. "If a triad is necessary for that deterrence, I can see that argument; I am skeptical about it," Smith said at an event hosted by the Center for a New American Security. The ICBM fleet "right now, is driven as much about politics as it is by policy and necessity," Smith added.

**Few Details:** While not offering details, Democratic presidential nominee Biden has indicated that he would place smaller emphasis on the role that nuclear weapons would play in a defense strategy. Biden's campaign website says he believes the "sole purpose" of the U.S. nuclear arsenal is for deterrence or, if necessary, for retaliation against an atomic attack.

"Our nuclear arsenal should be managed in a way that deters the use of nuclear weapons and makes nuclear use less likely. The use of even

one nuclear weapon would be catastrophic, cause significant casualties, and result in enduring radiation that could affect millions of humans, as well as the environment" Biden said in written answers to the Council for a Livable World. "There would be no 'winners' in a nuclear exchange."

Biden, in the same written responses, said the U.S. doesn't need new nuclear weapons, opposing the deploying of low-yield nuclear warheads. "A Biden administration will work to maintain a strong, credible deterrent while reducing our reliance and excessive expenditure on nuclear weapons," he said. "My administration will pursue a sustainable nuclear budget that maintains a viable deterrent for us and our allies."

The Pentagon's next generation ICBM program could cost U.S. taxpayers as much as \$110.6 billion, according to internal Defense Department estimates, adding to a wave of big-ticket nuclear weapons programs slated for the years ahead.

**Contracts Awarded:** The new estimate includes a \$13 billion contract Northrop Grumman Corp. received in September to start full-scale development and eventual production of missiles intended to replace the aging Minuteman III system, the land-based portion of the U.S. nuclear triad. The ICBM contract provides momentum for U.S. plans to modernize the capacity to deliver nuclear weapons through the triad, a bipartisan effort started during the Obama administration.

As part of the broader renovation, the Navy plans to start construction this month on the first Columbia-class nuclear missile submarine, an estimated \$128 billion program that will eventually

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produce 12 subs. General Dynamics Corp. won the contract for the new sub. Meanwhile, Northrop is the maker of the classified new B-21 stealth bomber, a program estimated at \$80 billion

Source: *Bloomberg Government*, <https://about.bgov.com>, 29 October 2020.

### Trump Administration Pushes Allies to Pressure China over its Nuclear Program

The Trump administration is working to pressure NATO allies to collectively crackdown on China's nuclear program as it looks to limit Beijing's growing influence in the global arms race. In a meeting with NATO allies President Donald Trump's top envoy for arms control, Marshall Billingslea urged allies to impose stricter arms control regulations on Beijing. The administration has been looking to convince China to enter into a nuclear agreement with the US and Russia, but with days to go until the election, efforts to extend an agreement with Russia have been fast-tracked and are proceeding absent the participation of Beijing which has not shown an interest in taking part in talks in recent times.

Billingslea's efforts are part of a broader push by the Trump administration to assert its view that China — and not Russia — presents the biggest threat to American national security, particularly in the wake of the Covid-19 virus, and the economic downturn in the US, which Trump has blamed on Beijing. Billingslea urged allies to impose consequences on China for its nuclear expansion, similar to the consequences China is increasingly facing over its 5G network, believed by the Trump administration and other countries to be a tool for espionage.

**The administration is arguing that China's efforts to increase the size of it means the US and its allies must take preemptive defensive actions, includes the deployment of additional missile defenses, to counteract the thousands of missiles China is allegedly building up. The administration also argues that China's nuclear expansion legitimizes its own expansion of deep strike capabilities to push back China's missile battalions.**

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"Unlike the United States and Russia where our nuclear weapons programs are both functionally and characteristically distinct — this particular reactor is for military purposes or for civilian purposes, The Chinese co-mingle everything. So all of their civil nuclear program is under the same Chinese communist party enterprises," a senior administration official told CNN.

They noted that the Chinese "have a doctrine called military civil fusion and the doctrine says any civil company will furnish upon request to the party technology for military applications. It's quite an alarming thing."

As part of his messaging to NATO allies, Billingslea showed a series of satellite images depicting the expansion of China's nuclear program over the past decade. The images, reviewed by CNN, were not particularly revelatory, nor did they offer any new information that might sway allies reluctant to go after China for its nuclear program.

Mianyang — one of the sites highlighted in Billingslea's presentation to NATO allies, is where China designs its nuclear weapons. Like the US, Russia and other nuclear-weapons states, China has a robust simulation program to sustain its

stockpile without testing, and it makes no secret about that, Lewis added.

A spokesperson for NATO declined to comment on the meeting. A senior official with one NATO member state told CNN, "it's obviously something we all care about," but said that the meeting ended with no clear request or plan of action from the US.

Despite progress in reducing Cold War nuclear arsenals, the world's combined inventory of nuclear warheads remains at a very high level, although the number is reducing. Approximately 91% of all nuclear warheads are owned by Russia and the United States who each have around 4,000 warheads in their military stockpiles.

That said, the US, Russia, and the United Kingdom are reducing their overall warhead inventories, France and Israel have relatively stable inventories, while China, Pakistan, India, and North Korea are increasing the number of warheads they possess, according to the Federation of American Scientists. This is particularly troubling to Washington and other allies who see an uptick in border disputes between China, India and Pakistan.

The Pentagon lists Chinese warhead stockpile as being in the "low-200s," although that number is widely believed to be higher since the Pentagon's most recent estimate, from 2019, only includes "operational" warheads. By comparison, Russia's total inventory is believed to be over 6,000 warheads, while the US currently has about 5,800.

In September, the Pentagon said that China is attempting to at least double the number of nuclear warheads in its arsenal in the next decade and its military has already equaled or surpassed the United States in a series of key areas. Billingslea

has made outreach efforts to China over its nuclear program but the Chinese have not responded and have shown very little enthusiasm for engaging in nuclear talks with either the US

or Russia. All the while, efforts to engage the Russians in discussions over arms control have made headway in recent weeks as the February 2021 expiration date of the New START agreement, designed to reduce the risk of war between Russia and the West, approaches.

Both Russian President Vladimir Putin and Trump's Democratic challenger, former Vice President Joe Biden, have said they would look to extend the treaty. However, Trump said he'd only agree to an extension if both sides also agree to freeze all warhead stockpiles. Putin said he'd consider freezing all warhead stockpiles, although officials say it remains unclear how sincere he is in that promise.

The US has previously offered Russia to sign a presidential memorandum that would serve as a blueprint for the next comprehensive deal and cover points of concern for the US, including China's nuclear potential and Russia's tactical nuclear weapons.

*Source: CNN, <https://edition.cnn.com>, 29 October 2020.*

### **How a Pacific Missile Test Site is Keeping up with Challenging Tests in a Pandemic**

The Ronald Reagan Ballistic Missile Defense Test Site in the Kwajalein Atoll hasn't missed a beat this year when it comes to testing, including a major hypersonic test at the start of the global coronavirus pandemic, according to the leader of the Army's Space and Missile Defense

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Command.

Through strict protocols limiting people onto the island and into the site, Kwajalein — part of the Marshall Islands — remained one of the few places on the globe that did not have any COVID-19 cases until Oct. 29 when two returning garrison employees tested negative upon departing Hawaii but tested positive upon arrival at the test site and are being quarantined.

Just to get onto the island, visitors are required to quarantine in Hawaii for two weeks and then to pass a COVID-19 test. Only about five to 10 people are approved to travel to Kwajalein a week, Lt. Gen. Daniel Karbler told Defense News in an interview earlier this month. Once on the atoll, visitors must quarantine another 21 days before being admitted to work at the site or move about the island, Karbler said.

The U.S. Army has found remote workarounds and is upgrading critical components at the site to keep up with a demanding calendar in 2021 that include more critical hypersonic missile tests, Karbler said. "Since the middle of June, we've been able to bring folks back into RTS in the Kwajalein Atoll to do our mission," he said.

The site helped conduct six joint Pentagon missions in FY20 including four Intercontinental Ballistic Missile Glory Trip missions as part of the Air Force Global Strike Command's Development Evaluation Program. The launches originated from Vandenberg Air Force Base in California, with impact at RTS.

Two missions used the Army's Kwajalein Mobile Range Safety System (KMRSS) Worthy, which is a missile range instrumentation ship. Worthy was used to collect telemetry data. The Army is prepared

to support the upcoming November flight test of the Standard Missile-3 Block IIA missile.... If successful, the test could pave the way for a Missile Defense Agency decision on whether to include it in a layered homeland defense approach against intercontinental ballistic missiles, according to MDA director Vice. Adm.

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Jon Hill.

The test will involve several time zones on several different ranges including RTS. And the test site will participate in major hypersonic tests in 2021 and 2022 as the Defense Department races to develop an offensive hypersonic missile as China and Russia make headway with their own capabilities.

The Army has been able to conduct a variety of activities in support of RTS remotely from Redstone Arsenal in Huntsville, Alabama, which is home of Army Space and Missile Defense Command, Karbler said.

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The service has also been able to remain on schedule when it comes to the upgrades needed for the site to support upcoming

tests, Karbler said. "Some of the things that we would normally do in preparation for tests that would have to be hands on, we're actually able to accomplish remotely thanks to some really, really, good, innovative work by the team," Karbler said.

The most significant of these upgrades is the x-band phased array Ground-Based Radar. The upgrade will add capacity, expand data collection capability and enable incorporation of state-of-the-art hardware and software.

The GBR upgrade is also a vital component of the range modernization plan to support increased Space Surveillance Network and Space Object



Identification capability for U.S. Space Command. RTS capability helps to track deep space objects and foreign launches and contributes space domain awareness over the U.S. Indo-Pacific Command area of operation.

Source: *Defence News*, <https://www.defensenews.com>, 29 October 2020.

## NUCLEAR ENERGY

### BELARUS

#### Belarus' Lukashenko Inaugurates Nuclear Power Plant amid Safety Concerns

Belarusian leader Alexander Lukashenko inaugurated a nuclear power plant that some neighbouring countries have opposed because of safety concerns. Built by Russian state-owned firm Rosatom and financed by Moscow with a \$10 billion loan, construction of the power plant near the city of Astravets, in the western Hrodno region, was vigorously opposed by Lithuania, whose capital Vilnius is just 50 kilometres (31 miles) away.

"This is a historical moment. The country will become a nuclear power," Lukashenko said in comments broadcast on state television. "The Astravets nuclear power station is a new step into the future, towards ensuring the energy security of the state."

Belarus began operating the plant earlier, prompting Lithuania to halt Baltics power trading with its neighbour. Latvia said it had restarted imports of power from Russia to the Baltic states, which had been suspended over concern that some of the electricity was produced at the Astravets facility. The plant's construction has also been divisive among Belarusians, who suffered greatly from the 1986 Chernobyl nuclear disaster.

Andrei Sannikov, a Belarusian opposition figure who was imprisoned after running against Lukashenko in 2010, wrote on Twitter the plant was a "geopolitical weapon" for Lukashenko and

the Kremlin against the European Union and a "radioactive danger for Belarus and Europe."

The inauguration comes as Belarus has been rocked by mass protests and strikes since an Aug. 9 presidential election the opposition says was rigged. Lukashenko, who has been in power since 1994, has rejected the accusations and dismissed opposition calls for him to step down.

Source: *Reuters*, [https://www.reuters.com/article/us-belarus-nuclearpower-id-USKBN27NOBP?taid=5fa69353260cc000018cd21e&utm\\_campaign=trueAnthem:+Trending+Content&utm\\_medium=trueAnthem&utm\\_source=twitter](https://www.reuters.com/article/us-belarus-nuclearpower-id-USKBN27NOBP?taid=5fa69353260cc000018cd21e&utm_campaign=trueAnthem:+Trending+Content&utm_medium=trueAnthem&utm_source=twitter), 07 November 2020.

### USA

#### Several U.S. Utilities Back Out of Deal to Build Novel Nuclear Power Plant

Plans to build an innovative new nuclear power plant—and thus revitalize the struggling U.S.

nuclear industry—have taken a hit as in recent weeks: Eight of the 36 public utilities that had signed on to help build the plant have backed out of the deal. The withdrawals come just months after the Utah Associated Municipal Power Systems (UAMPS), which intends to buy the

plant containing 12 small modular reactors from NuScale Power, announced that completion of the project would be delayed by 3 years to 2030. It also estimates the cost would climb from \$4.2 billion to \$6.1 billion.

"The project is still very much going forward," says LaVarr Webb, a spokesperson for UAMPS, which has nearly four dozen members in Utah, California, Idaho, Nevada, New Mexico, and Wyoming. Although some UAMPS members have dropped out, "promising discussions are ongoing with a number of utilities to join the project or enter into power-purchase agreements," Webb says.

However, critics of the project say the

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developments underscore that the plant, which is designed by NuScale Power and would be built at the Department of Energy's (DOE's) Idaho National Laboratory, will be untenably expensive.

NuScale, which was spun out of Oregon State University in 2007 and has benefited from DOE support, has designed a small modular nuclear reactor the company says will be safer, cheaper, and more flexible than a conventional gigawatt power reactor. Each of NuScale's little reactors would produce just 60 megawatts of power. A plant would contain 12 of the modular reactors, which would be built in a factory and shipped to the plant site. By relying on natural convection to cool the reactors and eliminating many pumps and pipes, NuScale engineers say they have designed a reactor that's even safer than a conventional power reactor.

In addition, operators can ramp the plant's output up and down by turning on and off the individual reactors. That capability makes it attractive to UAMPS as it tries to cut its reliance on coal-powered electrical plants and reduce emissions of heat-trapping carbon dioxide gas, Webbs says. UAMPS has turned increasingly to solar power and wind energy, he says, but because the Sun doesn't always shine and the wind doesn't always blow, utilities still need a supply of carbon-free energy on demand. "The idea is that nuclear will complement, augment, and back up your renewables," Webb says.

However, if the NuScale plant doesn't run constantly at full output, it will be less efficient and even more expensive to operate, in terms of cost MWh of energy, Ramana argues. Peter Bradford, a former member of the NRC and former chair of the state utility commissions in Maine and

New York, says renewables coupled with short-term storage in batteries would likely be a cheaper means to even out the supply.

Webb counters that energy markets in California have shown that without some flexible ability to produce electricity when renewable supplies dip, utilities must still rely on carbon-intensive coal. The deal protects UAMPS customers by specifying a maximum cost for electricity from the plant of \$55 per MWh, Webb says, which should make it competitive with the future price of electricity from gas. DOE will help ensure that rate, he says, as it recently finalized a plan to bear \$1.4 billion of the cost of the plant. "If it's more than \$55 [per MWh] we will not build the plant," he says.

**Critics of the project say the developments underscore that the plant, which is designed by NuScale Power and would be built at the Department of Energy's (DOE's) Idaho National Laboratory, will be untenably expensive.**

Bradford questions how reliable that reassurance can be. He notes that in the 1980s, Washington Public Power Supply System agreed to build several nuclear reactors in Washington that ran far overbudget and were never completed, leading to the biggest default on municipal bonds in U.S. history. Public utilities are particularly vulnerable to such risks, Bradford says, as other than ratepayers they have few sources of revenue that could be used to cover cost overruns. "Not only are there no deep pockets, there are no pockets," he says.

**On 28 October, Heber Light & Power in Utah withdrew from the project, just 1 day after utilities in the Utah communities of Bountiful and Beaver pulled out. Still, even critics doubt the UAMPS deal will fall apart immediately.**

On 28 October, Heber Light & Power in Utah withdrew from the project, just 1 day after utilities in the Utah communities of Bountiful and Beaver pulled out. Still, even critics doubt the UAMPS deal will fall apart immediately. In August, the NuScale design passed a key milestone in the NRC review process, receiving its safety evaluation report, and observers expect final "design certification" to come next year. In the meantime, UAMPS is moving to complete an application to construct

and operate the plant, Webb says. That application should be submitted in 2023, construction of the plant should start in 2025, he says.

Before construction can start, however, UAMPS still has to line up customers to buy the full 720-megawatt output of the plant, Webb says. So far, UAMPS members involved in the project have agreed to take only a relatively small fraction of that output. So UAMPS may have to convince plenty of other folks that it's a good deal.

*Source: American Association for the Advancement of Science, [https:// www.sciencemag.org](https://www.sciencemag.org), 04 November 2020.*

### **Why NASA Wants to Put a Nuclear Power Plant on the Moon**

NASA and the U.S. Department of Energy will seek proposals from industry to build a nuclear power plant on the moon and Mars to support its long-term exploration plans. The proposal is for a fission surface power system, and the goal is to have a flight system, lander and reactor in place by 2026.

Anthony Calomino, NASA's nuclear technology portfolio lead within the Space Technology Mission Directorate, said that the plan is to develop a 10-kilowatt class fission surface power system for demonstration on the moon by the late 2020s. The facility will be fully manufactured and assembled on Earth, then tested for safety and to make sure it operates correctly.

Afterwards, it will be integrated with a lunar lander, and a launch vehicle will transport it to an orbit around the moon. A lander will lower it to the surface, and once it arrives, it will be ready

for operation with no additional assembly or construction required. The demonstration is expected to last for one year, and could ultimately lead to extended missions on the moon, Mars, and beyond.

"Once the technology is proven through the demonstration, future systems could be scaled up or multiple units could be used together for long-

duration missions to the moon and eventually Mars," Calomino said. "Four units, providing 10 kilowatts of electrical power each, would provide enough power to establish an outpost on the moon or Mars. The ability to produce large amounts of electrical power on planetary surfaces using a fission surface power system would enable large-scale exploration, establishment of human outposts, and utilization of in situ resources, while allowing for the possibility of commercialization."

NASA is working on this with the Idaho National Laboratory (INL), a nuclear research facility that's

part of the DOE's complex of labs. But is the plan realistic, and is delivery possible six years from now? According to Steve Johnson, director of the Space Nuclear Power and Isotope Technologies Division at the Idaho National Laboratory, the answer is "yes."

"We are able to leverage years of research and development work on advanced fuels and materials as well as recent commercial space transportation advances to reduce risk to the schedule, to meet the 2026 date," Johnson said. "We really are striving to bring the commercial nuclear industry innovation to the table to work with NASA and the aerospace industry utilizing existing technologies." Calomino said that the technologies that are critical to the

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success of this project are a nuclear reactor, power conversion, heat rejection and space flight technology.

**How the Nuclear Plant will Work:** "A low enriched form of nuclear fuel will power the nuclear core," he said. "The small nuclear reactor will generate heat that is transferred to the power conversion system. The power conversion system will consist of engines that are designed to operate on reactor heat rather than combustible fuel. Those engines use the heat, convert it to electric power that is conditioned and distributed to user equipment on the lunar and Martian surfaces. Heat rejection technology is also important to maintain the correct operating temperatures for the equipment."

Johnson said that in addition to the research and development that has taken place over the past several decades, the existing physical infrastructure dedicated to creating the nuclear reactor, power conversion, heat rejection and space flight technology will make the 2026 timeline attainable. ...

Calomino said that the agency has partnered with the DOE, and they will jointly define mission and system requirements. The INL will manage development contracts for the fission surface power lunar system, including its reactor and shield, power conversion system, heat rejection system, and power management and distribution system.

"The fission surface power system will be designed to operate at around 10 kilowatts of electrical power for around 10 years," he said, adding that 10 kilowatts is roughly equivalent to the amount of energy needed to power three or four large households.

Calomino said that the laboratory issued a request for information to gauge industry interest and

solicit designs for the project. It received 22 written responses from large and small companies, all from the aerospace, nuclear, and power conversion sectors.

While he didn't give the names of any of these companies, he would say that the companies were all experienced in making nuclear reactors, developing spaceflight technology, and manufacturing the specialized equipment that will be needed for this particular project. He added that NASA and the DOE plan to release another request for proposals, related specifically to nuclear fission power, in early 2021. Future contract award values are still to be

determined. ... Calomino said that the project is so complex because it requires the integration of different organizational engineering skill sets. ...

**Is a Nuclear Reactor Safe on the Moon?** The idea of a nuclear reactor on the moon may seem unusual to the general public — or even dangerous. Andrew Crabtree, founder of the Get Into Nuclear employment agency, said that while there were many factors to consider in this effort, the issue of whether it's safe to use nuclear power in space is not one of them.

"Nuclear energy has been used in space numerous times before. ...Atomic energy has been operating on the moon since the flight in November 1969 of Apollo 12 successfully withstanding immense temperature variations. Apollo 12 marked the first use of a nuclear electrical power system on the moon." He also said that people with concerns about keeping space free of pollution should rest easy.

... Shel Horowitz, a profitability and marketing consultant for green businesses said that putting a nuclear power plant on the moon would be a boondoggle and a wholly unnecessary one at that. "With the rapidly falling cost of truly clean power

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from the sun, wind, and small-scale hydro, plus the growing efficiencies we've achieved through conservation, there is no reason to go through a lengthy, expensive, and fraught process," he said. "We can meet our energy needs without this."

In response, Calomino said that this project could very well call for the use of the same renewable energy sources cited by Horowitz. Other missions conducted in the future may require them as well, but there are unique challenges to operating in space that may make using renewable energy sources impractical, if not impossible.

"These missions could call for a variety of solar, battery, radioisotope and fission power systems to enable a wide range of demanding requirements," he said. "Fission surface power is necessary in places where solar power, wind and hydro power are not readily available. On Mars, for example, the sun's power varies widely throughout the seasons, and periodic dust storms can last for months. On the moon, the cold lunar night lingers for 14 days, while sunlight varies widely near the poles and is absent in the permanently shadowed craters. In these challenging environments, power generation from sunlight is difficult and fuel supply is limited. Fission surface power offers a lightweight, reliable and efficient solution."

... Despite these concerns, Calomino said that safety has been NASA's priority all along. The project still has to undergo the National Environmental Policy Act's approval process, which includes evaluating the project's environmental effects, and the power system will be designed so that nuclear fuel will not even be activated until it's on the moon's surface. "Unlike terrestrial reactors, there is no intention for fuel removal or replacement," he said.

Calomino said that at the end of its 10-year mission, there's also a plan to retire the facility safely. "At the end of life, the system will shut down, and radiation levels will gradually diminish to safe levels for human access and handling," he said. "The used systems could be moved to a remote storage location where they would not pose any threat to the crew or environment."

... While this endeavor is only in its opening stages, it suggests that the nuclear energy industry is still exploring new frontiers. Despite the complex political nature of the nuclear power issue, Dr. Morey said that its advantages make it ideal for powering U.S. efforts in space...."Realistically, it will be pivotal to deep space exploration, and more importantly, to humanity becoming a multi-planetary species. This new dawn of space exploration will see a resurgence in the nuclear industry until the next form of efficient, clean energy is discovered."

*Source: Daniel Bukszpan, <https://www.cnbc.com/2020/11/15/why-nasa-wants-to-put-a-nuclear-power-plant-on-the-moon.html>, 15 November 2020.*

### NUCLEAR COOPERATION

#### GENERAL

#### CIS Nations to Form Nuclear Regulatory Association

The CIS is a regional intergovernmental organisation of nine members, plus two founding non-member, post-Soviet republics in Eurasia. One of its members, Belarus, proposed the new initiative. Belarus is building its first nuclear power plant, in Ostrovets.

The Belarusian Energy Ministry said the new association is expected to promote cooperation in the regulation of nuclear and radiation safety in the CIS, to provide expert support in improving the system of regulation and legislation, and to strengthen ties between organisations that provide scientific and technical support.

... Olga Lugovskaya, head of the Nuclear and Radiation Safety Department of the Belarusian Emergencies Ministry (Gosatomnadzor), added that the association will provide an opportunity to exchange experience more effectively, including in terms of the development of regulatory requirements in nuclear and radiation safety, the inspections of nuclear power plant sites, and safety tests. Issues regarding regulation of radioactive waste management, training of personnel for regulators and others are also

important, she said.

According to the Energy Ministry statement, the commission considered the results of the CIS framework programme for cooperation in the peaceful uses of nuclear energy - Cooperation Atom-CIS - and the interstate target programme, Reclamation of territories affected by uranium mining.

The commission also reviewed the work of CIS members on the management of used nuclear fuel, radioactive waste and decommissioning of nuclear and radiation-hazardous facilities. The ministry said the commission's international working groups have drafted documents on its further activities - The CIS framework programme for cooperation in the peaceful uses of atomic energy until 2030 and the plan of measures to implement this framework cooperation programme for the period of 2021-2025. It is expected that these documents will be adopted by the Council of Heads of State to the CIS at its meeting next month.

Source: <https://world-nuclear-news.org/Articles/CIS-nations-to-form-nuclear-regulatory-association>, 28 October 2020.

## **INDIA-USA**

### **India-US Extend MoU Concerning Cooperation with GCNEP**

India and the US announced the extension of the duration of an MoU between them concerning cooperation with the GCNEP. The US also reaffirmed its "continued strong support" for India's early entry into the NSG, according to a joint statement issued after the 2+2 strategic dialogue between Defence Minister Rajnath Singh, External Minister S Jaishankar and their US counterparts Secretary of State Mike Pompeo and Secretary of Defence Mark T Esper.

**The CIS framework programme for cooperation in the peaceful uses of atomic energy until 2030 and the plan of measures to implement this framework cooperation programme for the period of 2021-2025.**

"Recalling the historic India-US Civil Nuclear Agreement, the ministers welcomed the project

Division of Responsibility principles between the NPCIL and the Westinghouse Electric Company (WEC) for the construction of six nuclear reactors at Kovvada (in Andhra Pradesh), and

looked forward to the detailed Division of Responsibility that would pave the way for a techno-commercial offer," it said.

The ministers also welcomed the extension of the MoU between the government of India and the government of the United States of America "concerning cooperation with India's GCNEP", the joint statement said. ...

Source: <https://www.outlookindia.com/newscroll/indiaus-extend-mou-concerning-cooperation-with-gcnep/1965272>, 27 October 2020.

## **NUCLEAR NON-PROLIFERATION**

### **IRAN**

#### **Iran's President Calls on Biden to Return to Nuclear Deal**

Iran's president called on President-elect Joe Biden to "compensate for past mistakes" and return the U.S. to Tehran's 2015 nuclear deal with world powers, a state-run news agency reported. Hassan

Rouhani's comments mark the highest-level response from Iran to Biden and Vice President-elect Kamala Harris clinching the Nov. 3 election.

"Now, an opportunity has come up for the next U.S. administration to compensate for past mistakes and return to the path of complying with international agreements through respect of international norms" the state-run IRNA news agency quoted him as saying.

**Now, an opportunity has come up for the next U.S. administration to compensate for past mistakes and return to the path of complying with international agreements through respect of international norms.**

Under President Donald Trump, tensions between the U.S. and Iran have escalated, reaching a fever pitch earlier this year. One of Trump's signature foreign policy moves was unilaterally withdrawing the U.S. from Iran's nuclear deal in 2018, which had seen Tehran limit its enrichment of uranium in exchange for the lifting of economic sanctions.

The U.S. has since reimposed punishing sanctions on Iran that have crippled its economy, which was further battered by the coronavirus outbreak. In an effort to pressure Europe to find a way around the sanctions, Iran has slowly abandoned the limits of the nuclear deal. "The people of Iran, though their heroic resistance against the imposed economic war, proved that the U.S. maximum pressure policy was doomed to fail," Rouhani said. He added Iran "considers constructive engagement with the world as a strategy."

Also, Iranian Foreign Minister Mohammed Javad Zarif tweeted that "the world is watching" to see if the new Biden administration would depart from Trump's approach toward Iran and seek international cooperation. "Deeds matter most," Zarif added. Meanwhile, Iran reached its highest ever single-day death toll from the coronavirus with 459 new deaths recorded. This brings Iran's total recorded deaths from the virus to 38,291 nationwide. Another 9,236 new confirmed cases of the virus were confirmed over the past 24 hours, bringing total confirmed cases to more than 682,000 nationwide since February.

Iran has struggled to contain the virus and has seen daily surges and highs over the past month. The capital, Tehran, has been the hardest-hit and recently extended some lockdown measures across the city.

*Source: The Associated Press, <https://www.usnews.com/news/us/articles/2020-11-08/irans-president-calls-on-biden-to-return-to-nuclear-deal>, 08 November 2020.*

## **NUCLEAR PROLIFERATION**

### **IRAN**

#### **Iran's Low-Enriched Uranium Stockpile 12 Times beyond Limit: IAEA**

**Iranian Foreign Minister Mohammed Javad Zarif tweeted that "the world is watching" to see if the new Biden administration would depart from Trump's approach toward Iran and seek international cooperation.**

Iran has stockpiled low-enriched uranium 12 times more than the limit set by a nuclear accord, while it also failed to provide a credible explanation about the presence of nuclear material in undeclared sites,

according to the United Nations' nuclear agency. The findings were reported by the IAEA in a confidential document given to member countries and seen by news agencies.

As of November 2, the nuclear watchdog said that Iran had a stockpile of 2,442.9kg (5,385.7 pounds) of low-enriched uranium, up from 2,105.4kg (4,641.6 pounds) reported on August 25. The nuclear deal Iran signed in 2015 with world powers allowed it only to keep a stockpile of 202.8kg (447 pounds).

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The IAEA reported that Iran has been continuing to enrich uranium to a purity of up to 4.5 percent, higher than the 3.67 percent

allowed under the crumbling accord. The document also stated that Iran's explanations over the presence of nuclear material at an undeclared site in the country were "not credible".

Despite Iranian authorities providing some information about the site, "the agency informed Iran that it continues to consider Iran's response to be not technically credible," the report said. "A full and prompt explanation from Iran regarding

the presence of uranium particles of anthropogenic origin ... at a location in Iran not declared to the Agency, is needed," it added.

The landmark nuclear agreement, officially known as the JCPOA, was signed to curb Iran's nuclear activities in exchange for sanctions relief. The goal was to prevent the country from building a nuclear weapon, something Iran has insisted it does not intend to do.

The Iranian government began scaling back a number of its JCPOA commitments following President Donald Trump's decision to unilaterally withdraw the United States from the accord in 2018, and the subsequent failure by its European signatories – France, UK and Germany – to secure Iran the economic benefits it was promised under the deal.

Iran has been allowing IAEA full access to its nuclear facilities after announcing in August it would permit inspections to two sites previously blocked. Tensions between Washington and Tehran increased as the US enforced its so-called "maximum pressure campaign" following its JCPOA exit, re-imposing punishing economic sanctions that have squeezed the Iranian economy and led, among other things, to soaring inflation and shortages of medicine.

A change in the two countries' nuclear diplomacy could be in sight as US President-elect Joe Biden has promised he would offer Iran "a credible path back to diplomacy", marking a stark change in Trump's aggressive rhetoric against Iran. Analysts, however, expect both Iran and the US to proceed cautiously in the early months of a Biden

presidency, with some saying the two countries could reach a "freeze-for-freeze" interim agreement in 2021, likely in the second half of the year, while broader negotiations will likely have to wait until 2022.

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Source: Al Jazeera, <https://www.aljazeera.com/news/2020/11/11/irans-low-enriched-uranium-stockpile-12-times-beyond-limits-un>, 11 November 2020.

### Iranian Parliament Approve Bill Specifying Increased Uranium Enrichment

Iran's parliament on 2 November approved a bill requiring the Atomic Energy Organisation of Iran (AEOI) to produce at least 120kg of 20% enriched uranium a year at its Fordow nuclear facility. AEOI is required to start this process within two months and store the enriched uranium inside the country.

In January, Iran took its final step in reducing its commitments in line with the July 2015 JCPOA. Under the JCPOA between the P5+1 group of countries, Iran had agreed to limit its nuclear development in return for the lifting of sanctions. However, in May 2018, US President Donald Trump pulled Washington out of the JCPOA and reimposed stringent sanctions and Iran, in turn, began to reduce its commitments under the agreement.

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The bill also requires AEOI to increase the enrichment capacity and production of enriched uranium to at least 500kg a month; start the installation of centrifuges, gas injection, enrichment and storage of materials up to "proper purity levels" within three months, via at least 1000 IR-2m centrifuges in the underground part of Shahid Ahmadi Roshan facility in Natanz; transfer any enrichment, research, and



development operations of IR-6 centrifuges to the nuclear site of Shahid Ali Mohammadi in Fordow; start enrichment operation via at least 164 centrifuges and expand it to 1000 by the end of 20 March 2021 (the end of the Iranian calendar year).

The AEOI must also return the 40MW Arak heavy water reactor to its "pre-JCPOA condition" by reviving the calandria of the reactor within four months from the date of the adoption of this law. Under the JCPOA, Iran was redesigning the reactor to reduce its production of plutonium.

The law also requires the Iranian government to suspend regulatory access beyond the IAEA Additional Protocol within two months after the adoption of the law. It calls for Iran to stop the voluntary implementation of the Additional Protocol if banking relations with Europe and the amount of oil purchases by the block does not return to normal. However, if the parties fulfil their undertakings, the government is required to submit a proposal to parliament for reciprocal action by Iran.

Earlier, on 28 October, IAEA confirmed that Iran, following a July explosion at the Natanz nuclear facility, had begun construction of a new underground centrifuge plant for uranium enrichment. "They started, but they haven't finished yet. It's a long process," IAEA director general Rafael Grossi Grossi said in an interview with the Associated Press.

*Source: Nuclear Engineering International, <https://www.neimagazine.com>, 05 November 2020.*

### NORTH KOREA

#### **N. Korea Estimated to have Up to 60 Nuclear Warheads: U.S. Think Tank**

North Korea is believed to have up to 60 nuclear warheads that can threaten regional stability,

according to a recent estimate by a research institute affiliated with the U.S. National Defense University.

The Institute for National Strategic Studies said in its Strategic Assessment 2020 report that the North is assumed to have between 15 and 60 nuclear warheads and approximately 650 ballistic missiles capable of threatening cities in South Korea, as well as in Japan and eastern China.

"Through the development of weapons of mass destruction, use of chemical weapons, and aggressive posturing of its conventional forces, the DPRK threatens regional stability and global norms," the report said, referring to the North by its official name. "It has also tested intercontinental ballistic missiles that could be capable of striking the United States," it added.

The report pointed out that an overwhelming estimate of 1.2 million North Korean

soldiers are "forward-deployed toward the Demilitarized Zone in an offensive posture" and continue to pose a conventional threat to South Korea and Japan.

*Source: Yonhap News Agency, <https://en.yna.co.kr/view/AEN20201111008600325>, 11 November 2020.*

## NUCLEAR DISARMAMENT

### INDIA

#### **UNGA Adopts Two India Sponsored Resolutions on Nuclear Disarmament**

The first committee of the United Nations General Assembly has adopted two India-sponsored resolutions on nuclear disarmament which aim to reduce risk of nuclear accidents and call for a prohibition on the use of nuclear weapons. The UNGA first committee deals with the issue of disarmament and works in close cooperation with the United Nations Disarmament Commission and the Geneva-based Conference on Disarmament,

the other two bodies to deal with the nuclear issue.

The two resolutions adopted include Convention on the Prohibition of the Use of Nuclear Weapons and Reducing Nuclear Danger under the Nuclear weapons cluster. The adoption of resolutions shows India's commitment towards the goal of nuclear disarmament.

The resolution on Convention on the Prohibition of the Use of Nuclear Weapons was backed by a majority of UN Members and was tabled by India since 1982. It calls for Conference on Disarmament to start negotiations on an international convention prohibiting the use or threat of use of nuclear weapons under any circumstances.

The aim is that a universal and legally binding agreement would generate the necessary global political will that can lead to the total elimination of nuclear weapons. One such treaty which has been proposed in the past is Nuclear Weapons Convention that outlaws nuclear weapons but negotiations on it are inactive at the Conference on Disarmament. ...

*Source: All India Radio, <http://newsonair.com/News?title=1st-committee-of-UNGA-adopts-two-India-sponsored-resolutions-on-nuclear-disarmament&id=403645>, 04 November 2020.*

## **JAPAN**

### **Hibakusha Hope Biden Promotes Nuclear Disarmament**

Survivors of the 1945 atomic bombings of Hiroshima and Nagasaki have expressed hopes that US president-elect Joe Biden will promote nuclear disarmament. Speaking to NHK, the acting leader of the Hiroshima branch of the Japan Confederation of A- and H-bomb Sufferers Organizations, Mimaki Toshiyuki, offered

congratulations on Biden's projected win.

Mimaki said former US president Barack Obama visited the city shortly before the end of his term, but Biden will hopefully come early in his term to visit the Peace Memorial Museum and the Atomic Bomb Dome.

He expressed the hope that Biden will take the initiative in persuading nuclear-armed countries to reduce their stockpiles, and

lead efforts to abolish nuclear weapons. Kawano Koichi, leader of another survivors' group, the Japan Congress against A- and H-Bombs, said the president-elect understands the importance of nuclear disarmament, and will tell the world that peace can be achieved without relying on nuclear weapons.

He said he wants Biden to persuade Russia to come to an agreement with the United States on mutual nuclear reduction. He urged

Japan to engage in full-fledged discussions with Biden on nuclear policy from the standpoint of the only country that has experienced atomic bombings. Kawano said having Biden as president is a great opportunity to achieve peace. He expressed the hope that the US will build friendly relations with other nations without resorting to military might.

*Source: NHK WORLD JAPAN, [https://www3.nhk.or.jp/nhkworld/en/news/20201108\\_24/?mkt\\_tok=eyJpIjoiWW1Sa1pHRTBabUpqTTJNSlslQjIjTRXh0UHVVVnRDN0hDbmpzdmIBT3dlcWlwNjIT](https://www3.nhk.or.jp/nhkworld/en/news/20201108_24/?mkt_tok=eyJpIjoiWW1Sa1pHRTBabUpqTTJNSlslQjIjTRXh0UHVVVnRDN0hDbmpzdmIBT3dlcWlwNjIT), 08 November 2020.*

## **NUCLEAR WASTE MANAGEMENT**

### **UK**

#### **Copeland Reconsiders Radioactive Waste Disposal Site**

A Cumbrian local authority is again considering hosting a disposal site for radioactive waste.

Copeland Council previously showed interest in the Geological Disposal Facility (GDF) but Cumbria County Council refused permission in 2013. The borough council has now formed a new working group to consult locally and identify a suitable site. ... The GDF would store the UK's higher activity radioactive waste - the most radioactive variety - underneath several hundred metres of solid rock.

**'Lake District Excluded':** The government first invited local authorities to volunteer to host the store in 2006 but said they could not proceed if local people opposed plans. Copeland and Allerdale Borough Councils and Cumbria County Council expressed an interest in housing a facility in 2012. The new working group said it did not "presuppose support for any potential site" for the facility. It will initially look at the whole of the Copeland borough area, but would exclude the Lake District National Park. Underground facilities off the coast would also be considered, it said. ...

Source: <https://www.bbc.com/news/uk-england-cumbria-54808533>, 04 November 2020.

### GERMANY

#### Nuclear Waste Shipment Arrives in Germany, Protests Likely

A shipment of reprocessed nuclear waste arrived at a port in northern Germany, and authorities were braced for likely protests as it is transported across the country to a storage site. A ship carrying six containers of waste from the Sellafield reprocessing plant in England docked in the early morning in Nordenham, news agency dpa reported. From there, it is to be transported by train to the now-closed Biblis nuclear power plant south of Frankfurt, several hundred kilometers (miles) away. ...

Germany recently launched a new search for a permanent site to store its most radioactive waste. A final decision is slated for 2031 and the aim is to start using the selected site in 2050.

Source: <https://abcnews.go.com/Business/wireStory/nuclear-waste-shipment-arrives-germany-protests-73966213>, 02 November 2020.



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