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**OPINION – Economic & Political Weekly**

**Handling Nuclear Weapons with Responsibility**

As reported in the media, Prime Minister Narendra Modi seems to have made what could be described as casual and callous remarks at an election meeting in Rajasthan about India’s nuclear weapons. He is reported to have asked, “Have we kept our nuclear bomb for Diwali?” Such expression is a major departure from the circumspection and public restraint shown by his predecessors on the question of nuclear weapons. While Modi’s boastful nuclear rhetoric is in keeping with his political persona and policy adventurism, it, however, dents India’s image as a mature and responsible nuclear state.

India had acquired minimum nuclear deterrence capability in 1974 itself, but was reluctant to acknowledge its status due to certain legal, technical, and geopolitical reasons. Even after proclaiming itself as a nuclear weapons state in 1998 and initiating steps to develop a nuclear triad consistent with the doctrine of “minimum credible deterrence,” India assured the international community that its nuclear weapons are for deterrence only and that it will not be the first to use them against any of its adversaries. Modi’s invocation of nuclear weapons to seek votes is unabashed warmongering that can have grave consequences for a region that already carries

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the image of a nuclear tinderbox.

Pakistani political and military leaders have also indulged in such bombast in the past, threatening that they would not hesitate to press the nuclear button. After holding each other to constant existential nuclear threat during the Cold War, the US and Russia have retreated to the bounds of sanity in their public discourse despite having thousands of nuclear weapons on hair trigger alert aimed at each other. The French and British leadership rarely talk about their nukes in public. The Chinese are always cryptic and measured on this issue. Israel, which has the largest and most sophisticated nuclear weapons programme outside of the P-5 countries, has not even

acknowledged its capability acquired in the late 1960s, and its continuing opaqueness seems to be serving its strategic and regional security interests well. Modi's glib talk, on the other hand, contradicts India's restrained nuclear posture and puts the country in the company of irresponsible states.

This is neither a case against India's nuclear weapons programme, nor an exhortation to sign the discriminatory NPT. In the absence of any progress towards global nuclear disarmament in a verifiable and time-bound manner, and being surrounded by hostile nuclear weapon states, one could possibly argue a case for India's strategic and national security need for nuclear deterrence. However, countries possessing nuclear weapons should exercise extreme prudence in their deployment posture and public conduct of its leadership because the costs of miscalculation or misinterpreted intentions can be catastrophic.

A large-scale nuclear war can produce mind-numbing regional and global environmental impacts. Medical professionals had warned that the healthcare system of any city or region will be totally paralysed after a nuclear attack and will be incapable to respond to the needs of the injured, who will be left in a pathetic situation of envying the dead. These imageries have fortunately produced a strong global aversion against nuclear weapons, thus earning the epithet of the "most useless weapon ever invented" and cementing a strong tradition of its non-use after 1945.

The Cold War nuclear scenarios may be less relevant for India and Pakistan, but even a limited nuclear exchange can have terrifying consequences for the region. We have seen how

poor the government support is to people for rebuilding their lives following a major natural disaster in both the countries. Unlike the Western and Soviet societies, which were generally better informed and educated by their governments, Indian and Pakistani societies are mostly unaware of the impact of nuclear weapons. The perennial border conflict between India and Pakistan has already invalidated the theory that nuclear weapon states do not directly fight each other. External intervention prevented a few crises spiralling into nuclear conflict, and it cannot be taken for granted that this will save the day every time.

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If it helps bring some sanity in our public discourse about using nuclear weapons, the detonation of the largest tested Pakistani nuclear weapon (a 45 kiloton device) over one of our major cities can result in over 5 lakh immediate deaths from the blast and fire, and 12 lakh injuries. A one megaton weapon

(China has several of them in its arsenal) can result in over 25 lakh immediate deaths and 60 lakh injuries. Predicting the number of deaths and injuries is a difficult and unpleasant exercise, but even these ballpark figures exclude the deaths and injuries that would result from the long-term radioactive fallout.

Nuclear war will bring unimaginable miseries to both India and Pakistan and should thus not be even casually talked about, let alone fought. The two Cold War adversaries deluded themselves that each would prevail after a full-scale nuclear war, only to realise that it produced a stalemate of mutually assured destruction. The Indian and Pakistani leadership should, therefore, avoid having a mutually assured delusion of prevailing in a nuclear war.

Source: <https://www.epw.in>, 04 May 2019.

**OPINION – David Krieger**

### **Imagination and Nuclear Weapons**

Einstein believed that knowledge is limited, but imagination is infinite. Imagine the soul-crushing reality of a nuclear war, with billions of humans dead; in essence, a global Hiroshima, with soot from the destruction of cities blocking warming sunlight. There would be darkness everywhere, temperatures falling into a new ice age, with crop failures and mass starvation. With nuclear weapons poised on hair-trigger alert and justified by the ever-shaky hypothesis that nuclear deterrence will be effective indefinitely, this should not be difficult to imagine. In this sense, our imaginations can be great engines for change.

In our current world, bristling with nuclear weapons and continuous nuclear threat, we stand at the brink of the nuclear precipice. The best case scenario from the precipice, short of beginning a process of abolishing nuclear arms, is that we have the great good fortune to avoid crossing the line into nuclear war and blindly continue to pour obscene amounts of money into modernizing nuclear arsenals, while failing to meet the basic human needs of a large portion of the world's population.

The only way out of this dilemma is for the leaders of the world to come to their senses and agree that nuclear weapons must be abolished in order to assure that these weapons will never again be used. Given the state of the world we live in, this is more difficult to imagine. What steps would need to be taken to realize the goal of nuclear abolition?

First, we would need a treaty to ban nuclear weapons. Such a treaty was agreed to in 2017 by a majority of countries in the United Nations, the Treaty on the Prohibition of Nuclear Weapons (TPNW). The treaty is now in the process of being ratified and will enter into force when ratified by 50 countries. Unfortunately and predictably, none of the nine nuclear-armed countries have supported the TPNW, and many have been overtly hostile to the treaty.

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Second, negotiations would need to commence on nuclear disarmament by the nations of the world, including all nine of the nuclear-armed countries. The NPT already obliges its parties to undertake such negotiations in good faith. Specifically, it calls for negotiations to end the nuclear arms race at an early date and to achieve complete nuclear disarmament. The nuclear-armed states parties to the NPT have failed to fulfill these obligations since 1970 when the treaty entered into force.

**What remains missing is the political will to implement the treaties. Without this political will, our imaginations notwithstanding, we will stay stuck in this place of potential nuclear catastrophe, where nuclear war can ensue due to malice, madness, miscalculation, mistake or manipulation (hacking). Imagination is necessary, but not sufficient, to overcome political will.**

Third, the negotiations would need to be expanded to encompass issues of general and complete disarmament, in order not to allow nuclear abolition to lead to conventional arms races and wars. Again, the states parties to the NPT are obligated to undertake such negotiations in good faith, but have not even begun to fulfill this obligation.

If we can use our imaginations to foresee the horrors of nuclear war, we should be able to take the necessary steps to assure that such a tragedy doesn't occur. Those steps have been set forth in the two treaties mentioned above.

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our imaginations notwithstanding, we will stay stuck in this place of potential nuclear catastrophe, where nuclear war can ensue due to malice, madness, miscalculation, mistake or manipulation (hacking). Imagination is necessary, but not sufficient, to overcome political will. Even treaties are not sufficient unless there is the political will to assure their provisions are implemented. To do this, imagination must be linked to action to demand a change in political will. The time is short, the task is great, and terrible consequences are foreseeable if we continue to be stuck at the nuclear precipice. To do nothing is simply unimaginable.

Source: <https://www.counterpunch.org>, 09 May 2019.

**OPINION – David Howell**

**Nuclear Paralysis and Nuclear Risk**

We are dangerously close to a world without arms control agreements. That is what some of the most experienced US defence and disarmament experts are now warning, and a recent detailed report from a UK House of Lords Committee fully shares their alarm. The implications for the increasing risk of nuclear weapons use, tactical or strategic, are direct, immense and horrific. The disarmament process, on which the previous generation put so much hope, has come to a halt and what is termed “policy paralysis” has set in.

Whether these warnings are going to attract the urgent attention, and the action, they deserve is an open question. Of course, in the Pacific Rim region the nuclear threat seems obvious and omnipresent, with unpredictable North Korean leader Kim Jong UN’s ongoing missile-launching activity still looming over nearby states, notably Japan. But in the West, it is quite different. A thick layer of complacency surrounds Western opinion about arms control and nuclear risk, built up from

assumptions that the basic architecture of global arms stability of the last 70 years still works and stays firm. Preoccupation with other issues, such as Brexit, immigration and global warming, blots out most media coverage of nuclear matters, even though one nuclear slipup could kill millions in minutes.

Comfort is drawn from the belief that the balance of mutual deterrence between nuclear powers still holds firm, that Russia and the United States — which possess 90 percent of the world’s stock of nuclear weapons — still have some sort of dialogue despite their antagonism (as in the Cold War), that the proliferation of nuclear weapons has been reasonably contained and will continue to be so, and that the full range of arms control and limitation treaties, agreed on 20 or 30 years ago, are still valid or can be renewed. Unfortunately, none of these conditions still hold true. It is just dawning on Western policymakers that the whole arms stability structure, far from maintain the balance of the decades since World War II, could soon become highly unstable.

First, there has been a vast deterioration in both Russian-US and Russian-European relations. The high hopes of the Gorbachev era have been replaced by Russian President Vladimir Putin’s ugly and threatening rhetoric. According to the NATO supreme commander, the two militaries are barely on speaking terms. Second, the “game,” if that is not a misnomer, is no longer a binary affair between two superpowers but, with the ascendancy of China, between at least three. This vastly complicates the whole notion of balance, especially when advanced Chinese technology is already producing hypersonic missiles that no one knows how to intercept. Third, while the global spread of nuclear weapons, much feared half a century ago, has up to now been limited, as far as is known, to four new countries — namely India,

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Pakistan, Israel and North Korea, beyond the original five existing nuclear powers, Iran could now be about to resume its path to nuclear weaponry — thanks to US President Donald Trump overthrowing the whole nuclear deal with Iran. If that happens Saudi Arabia has vowed to seek nuclear weapons and the tension between Iran and Israel could boil over, too.

The danger of nuclear weapons falling into terrorist hands would also be much increased. Fourth, in August America is withdrawing from the INF Treaty, signed in 1987 and requiring the progressive destruction of short- and medium-range missiles that could deliver nuclear warheads. The claim, probably correct, is that Russia has long been “cheating” and building new missiles that could easily hit targets across Europe. Fifth, new cybertechnologies are now of such power that they can disrupt anti-missile warning systems, send fake alarms, attack command and control systems and provoke “accidents.”

Faced with all these renewed dangers, some countries have put their faith in a new so-called ban treaty, simply demanding that all nuclear weapons should be banned forthwith. But wishing will not make it so, and might actually deflect attention from the gradual, step-by-step efforts to reduce international tensions and allow mutual disarmament to resume. Next year will come a major review of the 50-year-old NPT, which somehow holds the whole precarious pattern in place. The treaty accepts the legal right of the original five nuclear powers — the U.S., United Kingdom, Russia, China and France — to have nuclear weapons as long as they make progress to disarm and eventually get rid of them.

At the same time, it aims to protect all the non-possessor signatory states who understandably share a wish to halt the further spread of nuclear weapons, large or small. That is the theory, but in practice patience is wearing thin. Disarmament is not going ahead. New weapons systems are being developed. Old arms reduction treaties are not being renewed or replaced, or even discussed.

New treaties, such as the CTBT and the FMCT, have not been ratified or have stalled.

The leaders of the major powers like to say that nuclear weapons are tools to preserve peace, not instruments to wage war. But to make that hope into a certainty demands unceasing statesmanship to build trust, as well as to verify reassuringly what each country promises to do in the way of disarmament. Now, neither the necessary trust nor the

necessary reassurance are much in evidence — which is why a new arms race is beginning and the nuclear risk is increasing when the world has enough troubles already and can ill afford any more.

Source: <https://www.japantimes.co>, 10 May 2019.

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**OPINION – Nick Megoran**

**It's Disgraceful that Nuclear Weapons are Being Celebrated at Westminster Abbey**

On 27 October 1962, at the height of the Cuban missile crisis, the US navy dropped depth charges on the Soviet nuclear submarine B-59. With the vessel damaged and cut off from communication with Moscow, its captain, Valentin Savitsky, assumed that the US and USSR were now at war, and thus initiated steps to fire its nuclear torpedo at US forces. Protocol demanded that all three of the senior officers should approve the launch.

Although one officer agreed with Savitsky, the other, Vasili Arkhipov, vetoed the decision. The world came within a whisker of thermonuclear war.

The continued proliferation of nuclear weaponry represents one of the greatest threats to humanity's long-term survival. Yet Westminster Abbey is hosting a service to "celebrate" 50 years of Britain's "continuous at-sea deterrent" – that is, having a nuclear-armed submarine on constant sea patrol, ready to attack or threaten anyone, anywhere, any time. As part of a series of events led by the Royal Navy, the invitation-only congregation (including Prince William) will be asked to rejoice at this dubious achievement and, somewhat incongruously, to "pray for peace". Protests and peace vigils are planned to take place outside the abbey during the service, and nearly 200 Anglican clergy have signed a letter calling for it to be cancelled. They point out that in July 2018 the Church of England's General Synod passed a motion declaring that "nuclear weapons, through their indiscriminate and destructive potential, present a distinct category of weaponry that requires Christians to work tirelessly for their elimination across the world".

The dean of the abbey, the Very Rev Dr John Hall, has responded by saying that "the service will be neither one of thanksgiving nor in any way a celebration of nuclear armaments". However, invitations have described the event as a "national service of thanksgiving" and the Royal Navy has badged it as a way to "celebrate 50 years of success of [the] Navy's ultimate mission". ... In contrast, Britain's Trident nuclear submarines can each carry 40 nuclear warheads, each eight times as destructive as the bomb dropped on Hiroshima in 1945, which killed up to 150,000 people. There is therefore an extraordinary incongruity of the celebration of nuclear weapons.

Source: <https://www.theguardian.com>, 02 May 2019.

OPINION – Jamshid Barzegar

**A Desperate Move by Iranian President Rouhani**

Iran's move to partially withdraw from the 2015 nuclear deal not only jeopardizes the landmark international agreement, but also puts an end to the era of "moderation, diplomacy and hope" in Iran, says Jamshid Barzegar. Iran's decision to resume higher enrichment of uranium in 60 days if world powers fail to negotiate new terms for its 2015 nuclear deal will likely aggravate tensions with the United States and other global powers. In 2015, Iran and a group of world powers known as the P5+1...struck a landmark deal to limit Tehran's nuclear program.

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Iranian President Hassan Rouhani's domestic policies failed early in his tenure. His foreign initiatives, meanwhile, were met by strong opposition from Iran's supreme leader, Ayatollah Ali Khamenei, the Islamic

Revolutionary Guard Corps (IRGC) and other hard-line elements inside the country. Rouhani now either seems to not have a plan, or hopes to save the nuclear deal, known as the JCPOA, his sole achievement.

However, Iran's announcement was a result of Washington's decision on May 3 to bar sales of Iranian enriched uranium and heavy water to other countries. Rouhani said that Iran would hold on to stockpiles of enriched uranium and heavy water used in its nuclear reactors. Rouhani's announcement to roll back Iran's compliance with provisions of the nuclear accord will likely worsen already tense relations with the United States. Tehran also gave a 60-day deadline to the remaining parties of the agreement, saying that it would resume higher uranium enrichment if they failed to start delivering on their commitments to sanctions relief.

**Undermining the Deal:** The JCPOA limits Iran's uranium enrichment to 3.67%, but Iran can keep a

stockpile of no more than 300 kilograms of low-enriched uranium on its soil. Any enriched uranium in excess of this quantity has to be sent abroad. Until now, Iran was shipping it to Russia. Also, under the 2015 deal, Iran can keep no more than 130 tons of heavy water, a coolant used in nuclear reactors. Iran has been sending the excess to Oman.

The US administration's move to halt the sanctions waivers on buying the enriched uranium and heavy water from Iran as part of Washington's "maximum pressure" campaign has left Iran's leaders with two options: either fully dropping the uranium enrichment, or continuing with enrichment and stockpiling the excess inside Iran, which means breaching the JCPOA.

Iran's move will erode the bargaining power of Germany, France and the UK vis-a-vis the US, and may lead to the US and the EU joining forces in resuming sanctions. It's therefore not just Iranian leaders, but also the US and the EU that are accountable for the current situation and the resumption of sanctions. Despite US President Donald Trump's harsh comments on Iran and explicit criticism of the JCPOA, Trump has time and again shown signs of readiness to talk with Iranian officials. But the Islamic Republic has missed its chances of engaging in a dialogue with the Trump administration and is rejecting any talks. And this at a time when Iran's regional competitors, including Saudi Arabia and Israel, have been benefiting from the change in the balance of power in Washington since Trump came to power.

**Shifting Balance of Power:** The result of these developments would be a return to the era when Mahmoud Ahmadinejad was president of Iran — a time when hardliners like Saeed Jalili, Iran's

previous top nuclear negotiator, were leading the international nuclear talks. Meanwhile, Rouhani and Foreign Minister Mohammad Javad Zarif — who once claimed to be close to reformists — have shed their reputation as moderates in the Iranian political landscape. This development will strengthen the view within the Trump administration that there are no moderates within the Iranian regime. Some high-ranking US officials believe that there are only conservatives and ultra-conservatives in Iran.

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By issuing a 60-day ultimatum, Rouhani hopes to reach a better agreement and pressure the Europeans to find a way for Iran to bypass US oil and banking embargoes. Iran has been struggling for six years to have the sanctions lifted; the country is now staring at the possibility of facing even more severe embargoes. It's also worried about a possible military confrontation. These

developments come against the backdrop of Iran's regional and international policies, which are spearheaded by the supreme leader and the IRGC. These are policies that people like Rouhani, despite being opposed to, cannot intervene in.

Source: <https://www.dw.com,08 May 2019>.

#### OPINION – Brad Sawatzke

### Nuclear can Help Power the Future

Our society must act with greater decisiveness to reduce greenhouse gas emissions and transition to a cleaner, carbon-free future. If left unaddressed, the growing threat from climate change could have devastating consequences for future generations. We cannot roll the dice and hope this problem simply goes away.

Regardless of individual views on climate change and how differently we might view the threat, I think we can all agree that cleaner air and water

should be a common and achievable goal. Our state recently adopted legislation requiring electricity in Washington to be produced by 100 percent non-carbon-emitting resources by 2045, making Washington the fourth state in the country to adopt such a standard. The legislation will eliminate coal power by 2025, require electricity generation in the state to be greenhouse gas neutral by 2030, and ultimately require a 100 percent clean electric system by 2045.

This is not an unachievable goal, but it will require planning and forethought. The law recently signed by the Governor provides a practical approach for meeting this target, without jeopardizing the reliability of the grid or greatly increasing the price of our electricity. Washington is already one of the cleanest energies producing states in the country, thanks to an abundance of hydropower, renewable energy, and reliable, 24/7 nuclear power from the Columbia Generating Station. This is the key to attaining a clean energy future: an approach that is technology-neutral and values all carbon-free resources. Too often the debate over climate change focuses solely on renewables, like wind and solar, and an unrealized expectation that battery storage technology will advance quickly enough to make 100 percent renewables feasible.

I believe renewables and storage have an important role to play, but they alone cannot reliably power Washington's electric grid. The reason is simple: wind and solar only produce energy a fraction of the time and are unreliable during the hottest and coldest months of the year. If we want to have clean electricity 24 hours a day and 365 days a year, we will need energy sources that are reliable and predictable — capable of powering the electric grid when the

sun isn't shining and the wind isn't blowing. This is why the inclusion of nuclear energy in the state's clean energy standard is so critical. Nuclear power is carbon-free; operates 24-hours-a-day, seven-days-a-week; is impervious to unpredictable weather; and already provides more than half of our country's carbon-free electricity.

Nuclear also has the highest capacity factor of any energy resource — carbon-free or otherwise — providing clean, reliable power 92 percent of the time. Compare this to solar (25 percent), wind (35 percent), hydropower (43 percent; slightly higher in the Northwest), natural gas (51 percent), and coal (54 percent), and it becomes clear why nuclear energy is a critical solution to address climate change. If we truly want to improve our environment and address the coming storm then we need to utilize every tool at our disposal...not simply the most popular ones. At some point in the future we may have the technology to power our world using only renewable energy, but at present this is simply not

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possible. However, we have the technology to create a world powered by clean energy, and Washington state is now providing a roadmap to achieve this critical transformation.

Source: <https://www.tri-cityherald.com>, 10 May 2019.

**OPINION – Jarrett Blanc**

**Waivers for Civil Nuclear Cooperation with Iran are a No-Brainer**

The Trump administration is busy ratcheting up pressure on Iran: the president made clear he is going to try to use sanctions threats to force Iranian oil sales to zero. Earlier this month, he announced the designation of Iran's Revolutionary Guard Corps as a foreign terrorist organization. Now, members of the administration are debating whether to renew sanctions waivers for European, Chinese,

and Russian cooperation with Iran on civil nuclear projects. These waivers allow international partners to work with Iran on non-military projects without fear of U.S. sanctions.

Failing to renew the waivers would be indefensible.

The fact that there is even an internal debate is illuminating: At least some Trump advisors want a crisis with Iran, and the sooner the better.

Withdrawing waivers for civil nuclear cooperation may sound less aggressive than steps like the overhyped Guard Corps designation, but it is one of the most dangerous steps the administration has left, threatening the international nuclear cooperation that is Iran's only remaining practical benefit from the deal. The waivers cover three projects. The first is Fordow. Originally a secret underground uranium enrichment facility, the discovery of Fordow prompted severe international concern and multilateral agreement on sanctions that set the stage for the Iran deal. Under the deal, Fordow's uranium enrichment infrastructure was dismantled and the facility is to be turned into a harmless international "nuclear, physics, and technology centre" with leadership from Russia and the European Union. Some critics complained, Fordow was not "closed" and certainly, the deal did not require it to be dynamited or abandoned, but it was no longer a uranium enrichment facility. If Iran isn't allowed to work with Russia and the European Union on this new plan, it may return Fordow to more threatening uses.

The second is Arak, where prior to the deal, Iran was building a heavy-water nuclear reactor capable of producing enough weapons grade plutonium for a bomb every year. Under the deal, Iran destroyed the heart of the reactor in exchange for a promise that China and the United States would help oversee the design

and construction of a replacement reactor that would produce much less and lower grade plutonium that cannot be used for weapons. The United Kingdom has now stepped into the US role. Iran wants to proceed with the new reactor design and its negligible proliferation risk. If China and

the United Kingdom withdraw from the project due to threatened US sanctions, Tehran may simply return to the old plan. A great deal has been made of ambiguous Iranian statements about spare parts that could be used to rebuild the heart of the reactor, but of course Iran is capable of redoing

the project they have already built and dismantled once. That is why negotiators insisted not just on destroying the core but rebuilding the reactor using a different design.

The last is Iran's only functioning commercial nuclear reactor, a Russian-supported project in Bushehr. Bushehr originally dates to the Shah's time but was derailed by the Iranian revolution and the Iran-Iraq war. Russia took over in 1995, and as U.S. anxiety about Iran's nuclear program rose, it was a point of contention between Washington and Moscow. Still, Russia took non-proliferation concerns seriously, controlling

Bushehr's fuel so that Iran would not be able to divert fissile material from civilian to military uses. While the U.S. never provided specific waivers, it also never enforced sanctions on the Russian partners in Bushehr.

Even now, advocates of withdrawing the other

waivers, like the Foundation for Défense of Democracies, often make an exception for Bushehr, saying that it does not pose a proliferation concern. They are right, but since the same is true of the other two projects, the real distinction must lie elsewhere. If Washington doesn't provide new waivers and

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applies new sanctions, it is doubtful that Russia would comply. Rosatom, Russia's international commercial nuclear provider, an irreplaceable partner for the United States in nuclear safety and security projects worldwide, is probably too important for the U.S. to sanction in turn. It is hard to predict what will happen if Washington refuses to extend some or all of these waivers. Most of the sanctions re-imposed by US withdrawal from the Iran deal target private sector actors, so compliance or violation is not a government decision. Much of the nuclear cooperation resides in governments. While individual officials might fear U.S. sanctions, would the proud governments that negotiated the deal actually walk away in face of U.S. threats? If they stand their ground, would the United States actually target the governments of some of its closest allies and most important partners?

So, why would the United States risk the continued non-proliferation achievements of the Iran deal — now sustained despite tremendous economic pressure on Iran — as well as a break with our allies? Simple. Iran is still complying with the deal. So long as it continues to do so, a future Democratic president could simply return the United States to the deal, undoing the hard work of Iran hawks around Trump. Some critics of the Iran deal want to wall in future presidents. But new Trump sanctions can be undone from the White House. The only reliable way to kill the nuclear deal is to pressure Tehran into a violation. Iranian Foreign Minister Javad Zarif repeated a dark threat that Iran might withdraw from the nuclear deal and even from the NPT. Unfortunately, some of President Trump's advisors and supporters — the advocates of withdrawing civil nuclear cooperation waivers — prefer a return to an unconstrained Iranian nuclear program rather than a return to the realistic and effective diplomacy that produced the Iran deal. It is hard to imagine a riskier or more foolish basis for making policy in a tense region.

Source: <https://warontherocks.com,29 April 2019>.

OPINION – Aditya Ramanathan, Kunaal Kini

**Are Pakistan's Battlefield Nuclear Weapons a Mirage?**

In April 2011, Pakistan conducted the first test of its short-range Hatf-IX or Nasr rocket. The test was interpreted as marking a shift in Pakistan's nuclear posture to "full spectrum deterrence," which envisages a complete range of "strategic, operational and tactical" nuclear weapons that would give India "no place to hide." More specifically, Pakistan claimed the Nasr was intended to "pour cold water over Cold Start," the

name given to the Indian Army's doctrine, which involves the rapid mobilization of division-sized integrated battle groups making shallow incursions into Pakistani territory.

Although Cold Start is still a work-in-progress, and Pakistan already enjoys considerable conventional deterrence against India, its army has tested the Nasr

several times since 2011, publicly talking up its "shoot and scoot attributes" that supposedly help "deter evolving threats." Despite the many tests, it's not clear if the rocket system is actually in service, since it apparently remained undeployed as late as 2016.

**Understanding the Nasr.** The first Nasr test came seven years after the new Cold Start doctrine was revealed at an Indian Army Commander's Conference in 2004. In the years that followed, the Indian Army leadership remained cagey about discussing the new doctrine, only obliquely referring to a "proactive strategy." That changed in 2017, when current army chief General Bipin Rawat bluntly acknowledged its existence.

The Nasr is generally believed to be based on either China's WS-2 Weishi or the similar AR1A/A100-E conventional rocket artillery system. According to the one estimate from a trio of scholars from Bangalore's NIAS, the Nasr's warhead section is 1.6 meters long, with a

**The Nasr's warhead section is 1.6 meters long, with a cylindrical portion that's just under a meter in length and a conical portion that adds another 660 mm. The outer diameter of the cylindrical portion is 361 mm. The Nasr is believed to have a payload capability of 400 kilograms. While the rocket itself is unremarkable, designing and manufacturing a nuclear warhead for such a small weapon system presents its own hurdles.**

cylindrical portion that's just under a meter in length and a conical portion that adds another 660 mm. The outer diameter of the cylindrical portion is 361 mm. The Nasr is believed to have a payload capability of 400 kilograms. While the rocket itself is unremarkable, designing and manufacturing a nuclear warhead for such a small weapon system presents its own hurdles.

**Design Challenges:** The simplest way for Pakistan to design an ultra-compact warhead on the Nasr would be to obtain a design from someone else. China would be the most probable candidate. While such a transfer can't be ruled out, it's still unlikely the Chinese could have provided Pakistan with an off-the-shelf design. The People's Liberation Army has no known nuclear-capable missiles with a similar range or payload. Indeed, China has a no-first-use policy that eschews battlefield nuclear weapons.

However, Pakistan is known to have received the Chinese CHIC-4 bomb design, which was first tested in 1966. China may have even subsequently tested a Pakistani variant in 1990. The CHIC-4 is a bulky design that reputedly weighs 1,180 kilograms. According to Brigadier Feroz Hassan Khan, a chronicler of Pakistan's nuclear weapons program, Pakistan cut the weight of the CHIC-4 design down to about 500 kilograms.

According to Khan, the nuclear test conducted in the Kharan Desert on May 30, 1998, was of a "miniaturized device" for ballistic missiles and aircraft. His claim gains some credence from events a decade later, when investigators following the A.Q. Khan network in Switzerland found bomb plans that were either identical or similar to that of the 1998 device. A story in the New York Times described the device as being "half the size and twice the power" of the CHIC-4 and featuring "far more modern electronics."

Khan also goes on to claim that Pakistani nuclear scientists later halved the weight of the nuclear device again bringing it down to 220 kilograms. However, it's not clear when this was achieved or how much they managed to reduce the weapon's volume. What seems likely is that Pakistan

possessed viable warhead designs for its medium-range ballistic missiles by 1998, even if these warheads were too large for the Nasr.

**Plutonium or Uranium?** Like China, Pakistan started out by making implosion bombs based on HEU. (In these bombs, a conventional explosive compresses the fissile core into a supercritical mass.) Pakistan's 1998 nuclear tests were based on such designs. But for smaller warheads like the Nasr's, Khan believes Pakistani scientists will "likely use a plutonium warhead with an implosion assembly." The NIAS study similarly concludes that a variant – the plutonium-based linear implosion device – is best suited for the slim profile of the Nasr missile.

However, as the authors of the NIAS study note, there are two problems with this approach. First, since the linear variant needs twice the amount of fissile material as a spherical implosion system, Pakistan would run out of its estimated plutonium stock (as of 2013) after producing just 12 warheads. Second, any such device would be untested.

An alternative for Pakistan is to reject the implosion system altogether and produce a simple gun-type HEU device – essentially a highly miniaturized version of the bomb dropped on Hiroshima in 1945. Such a device would need no testing and could be fitted into the Nasr. It would, however, go against the deeply-ingrained preference for implosion devices among Pakistan's weapon-makers.

Whatever its design options, Pakistan may also be facing greater constraints on its supply of fissile material than previously thought. While previous estimates put Pakistan's arsenal size in 2018 at 140-150 warheads (and growing at the rate of about 10 warheads a year), a recent assessment suggests Pakistan's dwindling domestic supply of uranium will limit its nuclear arsenal size to between 112 and 156 weapons. While such studies are necessarily speculative, it's likely Pakistan will be forced to make hard choices when it allocates weapons-grade material among its growing array of missiles.

**Considering the Cold War Experience:** Pakistan could adopt more than one pathway toward miniaturizing a Nasr warhead, but how long would the process take? Information about the current state of Pakistan's nuclear weapons program is scarce, but U.S. and Soviet efforts at miniaturization during the early years of the Cold War provide some indications.

In 1949, the United States began a project to develop nuclear artillery for battlefield use. Just four years later, a 280 mm cannon fired a shell with the new W-9 warhead, which airburst 10 kilometres away, with a yield of about 15 kilotons. The W-9 was a simple gun-type HEU fission device. Over the next decade, the United States would produce even smaller nuclear artillery, including a tiny plutonium linear implosion warhead that could be fired from a standard 155 mm artillery piece.

The Soviets took longer to miniaturize. After they became a nuclear power in 1949, the Soviets struggled to catch up with the U.S. atomic artillery program, only producing small warheads in the early 1960s. By then, new nuclear-capable artillery rockets like the Luna-M had already superseded atomic cannons. Considering these time scales of 4-15 years, could Pakistan have developed a miniaturized device for the Nasr between the first indications of Cold Start in 2004 and the present?

In developing a miniaturized warhead, the Pakistanis would have enjoyed two principal advantages over their Cold War counterparts. One, they would have had a head start, having worked on warhead designs since the 1970s. Khan notes that between 1983 and 1995, Pakistan carried out

at least 24 "cold tests" of their nuclear devices (in which the bomb is detonated minus the fissile core). The devices were also ruggedized and tested for "vibrations, environment, acceleration," according to a senior Pakistani nuclear physicist, Samar Mubarakmand quoted by Khan. In May 1995, Pakistan conducted a successful aerial cold test from a combat aircraft, with the device exploding 500 meters above ground.

The second advantage the Pakistanis would have over older Soviet or American nuclear weapons designers is advances in technology. For instance, modern

electronics would make it easier to design reliable fuses and to correctly detonate the weapon's explosive lenses.

Against these, Pakistan suffers three disadvantages. One, for all its diversion of resources, Pakistan cannot match the budgets of the superpowers at the height of the Cold War. Two, the Soviet and American programs were enabled by an abundance of fissile material. In contrast, Pakistani supplies are constrained. Three, the superpowers could conduct hot tests,

allowing them to validate and improve their designs. Pakistan, on the other hand, can't perform hot tests of its new warhead designs without incurring widespread diplomatic wrath.

**A Limited and Vulnerable Arsenal:** This article assumes Pakistan's nuclear

weapon-makers are adequately competent and get preferential access to resources. Nevertheless, to make Nasr warheads, they would not only have to manage costs but also work with a limited supply of fissile material and design new nuclear warheads without being able to test them. It is conceivable Pakistan has skipped these

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painful steps entirely and is simply bluffing about the Nasr's nuclear capabilities. Lacking certainty, India would still have to factor in nuclear-capable Nasrs in its plans, even if it remains Pakistan would actually use the rocket.

Another approach for Pakistan would be to produce only a small number of nuclear warheads for the Nasr while increasing the number of conventionally armed Nasr rockets and launchers in its inventory. During a crisis, Pakistan could conspicuously move a few launchers to catalyze intervention from third-parties worried about nuclear escalation. If crisis turns into conflict, the Pakistan Army would hope that a multitude of mostly conventional Nasr launchers on the move would stress Indian intelligence, surveillance, reconnaissance (ISR) resources and divert its military efforts. In Pakistan's calculation, this would have the effect of complicating India's plans while minimizing its own command and control challenges.

However, this will not solve the problems inherent in a system like the Nasr. The rocket's short range of 70 kilometers would force the Pakistan Army to deploy launchers perilously close to the fighting, making them vulnerable to India's conventional firepower. This makes the Nasr highly destabilizing since the Pakistanis will have to worry about survivability of what is likely to be a small arsenal of nuclear-capable rockets.

Targeting Indian forces will also remain a challenge. Once a decision has been made to use nuclear-tipped Nasrs, the Pakistan Army would have to locate mobile targets, ensure there are no friendly forces in the vicinity, and then quickly communicate that information to the rocket crews before they are destroyed and before the information becomes obsolete. What's more, it will have to do all this while immersed in the thick fog of war.

The technical and operational hurdles involved in creating a fully-functional force of battlefield nuclear weapons would challenge any country. For Pakistan, some of these challenges – such as limits on fissile material and the short range of the Nasr – are especially acute. There are suggestions the Nasr would be used as part of a larger nuclear first strike against both counterforce and countervalue targets. But Pakistan has a formidable arsenal of missiles that offer better strike options than the Nasr. All things considered, it is likely the Nasr is at present a mirage aimed at the minds of India's decision makers, rather than a military reality targeted at its armoured columns.

*Source: <https://thediplomat.com>, 07 May 2019.*

**OPINION – Sébastien Seibt**

**From the A Bomb to the AI Bomb, Nuclear Weapons' Problematic Evolution**

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At 2:26 am on June 3, 1980, Zbigniew Brezezinski, US President Jimmy Carter's famously hawkish national security adviser, received a terrifying phone call: 220 Soviet nuclear missiles were heading for the US. A few minutes later, another phone call offered new information: in reality, 2,220 missiles were flying towards the US. Eventually, as Brezezinski was about to

warn Carter of the impending doom, military officials realised that it was a gargantuan false alarm caused by a malfunctioning automated warning system. Thus, the Cold War nearly became an apocalypse because of a computer component not working properly.

This was long before artificial intelligence (AI) rose to prominence. But the Americans and Soviets had already begun to introduce algorithms into their control rooms in order to make their nuclear deterrence more effective. However, several incidents – most notably that of June 3, 1980 – show the disadvantages of using AI.

**'Novelty Implies New Vulnerabilities'**: Almost forty years on from that near debacle, AI seems to have disappeared from the nuclear debate, even though such algorithms have become ubiquitous at every level of society. But a report by the SIPRI published on May 6 underlines the importance of this aspect.

The nuclear arms race still poses a considerable threat, seeing as Donald Trump's America has promised to modernise its arsenal, North Korea seems uninterested in abandoning its nuclear programme, and relations are tense between neighbouring nuclear powers and historical antagonists India and Pakistan.

However, technological breakthroughs in AI show "enormous potential in nuclear power, as in the areas of conventional and cyber weapons", said Vincent Boulanin, the researcher at SIPRI responsible for the report, in an interview with FRANCE 24. In particular, machine learning is "excellent for data analysis", Boulanin continued. Such work could play an essential role in intelligence gathering and the detection of cyber attacks.

**Russia Resurrects Soviet AI System**: "In truth, we know very little about the use of AI in nuclear weapons systems at present," Boulanin admitted. Russia is the only world power to have brought up the issue recently, with President Vladimir Putin announcing in March 2018 the construction of a fully automated nuclear submarine called Poseidon. Furthermore, in 2011 Moscow resurrected and updated the Perimetr system, which uses artificial intelligence to be able (under certain conditions) to detect an atomic bomb by another state. But experts consider these

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**There is, however, a very dark side to AI. By nature, it implies the delegation of decision-making from humans to machines – which would carry serious "moral and ethical" implications. Countries need to take a clear stance on this" so that they don't have robotic hands on the red button.**

announcements to be lacking in concrete details.

In part, such scepticism stems from the fact that "the adoption of new technologies in the nuclear field tends to be rather slow because novelty implies the possibility of new vulnerabilities", Boulanin pointed out. Those in control of nuclear weapons programmes prefer to work on outdated computers instead of state-of-the-art technologies that are at risk of being hacked.

Nevertheless, Boulanin continued, it's only a matter of time before the nuclear powers adopt AI in their weapons systems, considering the enticing prospects of such technology. Its main advantage is that algorithms are an awful lot faster than humans at processing information.

AI could also make guidance systems for missiles more accurate and more flexible, according to Boulanin. "This would be especially useful for high velocity systems that human can't manoeuvre," he said. Indeed, several countries are working on prototypes of hypersonic aircraft and missiles able to fly five times faster than the speed of sound. It would be impossible for humans to intervene on the trajectory of such missiles, while AI could correct the aim if necessary.

**The Dark Side of AI in Nuclear Weapons**: There is, however, a very dark side to AI. By nature, it implies the delegation of decision-making from humans to machines – which would carry serious "moral and ethical" implications, noted Page Stoutland, vice-president of the NTI, which collaborated in the SIPRI report. On this basis, "the guiding principle of respect for human dignity dictates that machines should generally not be making life-or-death decisions", argued Frank Sauer, a nuclear

weapons specialist at the University of Munich, in the SIRI study. "Countries need to take a clear stance on this" so that they don't have robotic hands on the red button.

That's while algorithms are created by humans and, as such, can reinforce the prejudices of their creators. In the US, AI used by the police to prevent reoffending has been shown to be "racist" by several studies. "It is therefore impossible to exclude a risk of inadvertent escalation or at least of instability if the algorithm misinterprets and misrepresents the reality of the situation," pointed out Jean-Marc Rickli, a researcher at the Geneva Centre for Security Policy, in the SIRI report.

**Risk of Accidental Use:** Artificial intelligence also risks upsetting the delicate balance between the nuclear powers, warned Michael Horowitz, a defence specialist at the University of Pennsylvania, in the SIRI study: "An insecure nuclear-armed state would therefore be more likely to automate nuclear early-warning systems, use unmanned nuclear delivery platforms or, due to fear of rapidly losing a conventional war, adopt nuclear launch postures that are more likely to lead to accidental nuclear use or deliberate escalation." That means that the US – which boasts the world's largest nuclear stockpile – will be more cautious in adopting AI than a minor nuclear power such as Pakistan.

In short, artificial intelligence is a double-edged sword when applied to nuclear weapons. In certain respects, it could help to make the world safer. But it needs to be adopted "in a responsible way, and people needs to take time to identify the risks associated with AI, as well as pre-emptively solving its problems", Boulanin concluded.

One sobering comparison might be with the financial services industry. Bankers used the same arguments – the promises of speed and reliability – to introduce AI to the sector as those used by its advocates in the nuclear weapons field. Yet the use of AI in trading rooms has led to some very unpleasant stock market crashes. And of course, nuclear weapons will give AI much more to play with than mere money.

*Source: <https://www.france24.com>, 10 May 2019.*

### NUCLEAR STRATEGY

#### ISRAEL

##### **Netanyahu: Israel will not Allow Iran Nuclear Weapons**

Prime Minister Benjamin Netanyahu, in a Memorial Day ceremony held at Mt. Herzl, said: "This morning, on my way here, I heard that Iran intends to pursue its nuclear program" He added. "We will not allow Iran to achieve nuclear weaponry. We will continue to fight those who would kill us".

Netanyahu's comments came after announcement by Iranian President Hassan Rouhani that Iran would stop complying with two of its commitments under the Iranian nuclear deal. Reiterating a long-held Israeli position after Tehran announced it was scaling back some of its commitments under a 2015 nuclear deal. ...

*Source: <https://www.ynetnews.com/articles/0,7340,L-5506297,00.html>, 08 May 2019.*

#### UK

##### **UK's Defence Strategy Revealed: Laser Attacks, Missiles and Nuclear Weapons Major Risks**

British satellites are at grave risk from a range of security threats, including attacks by lasers, missiles and even nuclear weapons, a leaked MoD report has warned. And plans for Britain to develop a rival to the EU's Galileo Satellite System have been given the enthusiastic backing of defence chiefs. The MoD is drawing up plans to protect British hardware in the face of "increasing and diversifying" risks – with one expert telling Express.co.uk "appropriate measures" were needed. Whitehall's first defence space strategy, which has been leaked to *The Times*, identifies ten key risks to British satellites, ranging in seriousness from temporary denial of service to attacks capable of completely destroying equipment.

Consequently, the MoD is proposing a raft of measures aimed at safeguarding the space

infrastructure which is becoming increasingly important to both the armed forces and members of the public. Modern satellites provide communications rays, precision targeting and enable the military to keep track of friendly force, while banks and emergency services rely on ultra-accurate clocks regulated from space. The report warns that as reliance on space “continues to grow”, so too do threats from both state actors and private companies. The document adds: “Both China and Russia have admitted testing ground-based interceptor missiles that have the potential to target satellites.

“Such systems will create significant amounts of orbital debris, putting many hundreds of other satellites at risk.” Simultaneously, companies were developing technology “which in the wrong hands could be used against satellites”, including electromagnetic interference, laser dazzling, missiles and “exo-atmospheric nuclear attack”.

The MoD last year confirmed that its space defence workforce would rise by a fifth to 600 people, indicating how seriously it is taking the situation. Defence Intelligence, the military intelligence agency, will also have a bigger role in monitoring the threats. Efforts will be centralised in a new National Space Operations Centre as Britain aims to capture 10 percent of the global space market, including tourism, by 2030. Britain is a world leader in satellite technology, with 25 percent of telecommunications satellites built in this country.

The strategy offers enthusiastic backing to plans for a British global positioning, navigation and timing satellite system, with Brexit negotiator Michel Barnier saying Britain faces the prospect of being excluded from Galileo after leaving the EU. The £92million feasibility study to investigate the possibility of developing a rival system was launched last year. The report concludes: “We

expect the threat level to continue increasing for the foreseeable future. Our adversaries understand our reliance on space services.”

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The report concludes: "We expect the threat level to continue increasing for the foreseeable future. Our adversaries understand our reliance on space services." Dr Stuart Eves, an independent consultant who was previously Lead Mission Concepts Engineer for Surrey Satellite Technology Limited, said: "There's a clear analogy here between air power and space power.

"Around the time of the Second World War, control of the air domain became central to success in military conflicts. As a consequence, aircraft became targets for a variety of surface-to-air and air-to-air weapon systems. In response, aircraft designers adopted stealth technologies, decoys, and emission control procedures, (EMCON), etc, to protect their assets. "Around the time of the first Gulf War, space became central to winning modern conflicts. Since then we've seen various nations demonstrate anti-satellite capabilities. "Clearly if the UK elects to invest in surveillance, communications and navigation satellite constellations in the future, it will need to adopt appropriate measures to protect those systems

from the increasing threats that they face." An MoD spokeswoman said that it did not comment on leaked documents.

*Source: <https://www.express.co.uk/news/world>, 08 May 2019.*

## **USA-RUSSIA**

### **Is the Pentagon Exaggerating Russian Tactical Nuclear Weapons?**

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Washington is buzzing with warnings that Russia is increasing its number of non-strategic nuclear weapons. The Trump administration's Nuclear Posture Review (NPR) is clear and unequivocal: "Russia's non-strategic nuclear weapons modernization is increasing the total number of such weapons in its arsenal." The NPR's threat assessment and embrace of what it calls "the return of Great Power Competition" are based on the premise that Russian and Chinese military capabilities and political activities have changed so dramatically in the past ten years that US defense planning also must change significantly (beyond the changes already made during the past decade).

At the nuclear level, the alleged "increase" of the size of Russia's non-strategic warhead inventory is front and center to the claim made by the NPR and defense hawks

that Russian nuclear strategy has become more dangerous. Russia has a new reckless "escalate-to-deescalate" strategy that is more willing to use low-yield tactical nuclear weapons first, so the argument goes (although this characterization has been rejected by some independent experts).

Therefore, the NPR says, the United States must build new low-yield nuclear weapons to "help

**The NPR says, the United States must build new low-yield nuclear weapons to "help counter any mistaken perception of an exploitable 'gap' in US regional deterrence capabilities." In response, the Trump administration has already begun production of a low-yield nuclear warhead – the W76-2 – that will arm the Navy's ballistic missile submarines from next year.**

counter any mistaken perception of an exploitable 'gap' in US regional deterrence capabilities." In response, the Trump administration has already begun production of a low-yield nuclear warhead – the W76-2 – that will arm the Navy's ballistic missile submarines from next year. And it is pursuing the development of a new tactical nuclear sea-launched cruise missile.

It seems like a perfect threat-funding-loop sales pitch: Russia is increasing its non-strategic nuclear weapons that it is more prepared to use first, so give us more money to build new nukes. But is Russia actually increasing the number of its non-strategic nuclear weapons? In stark contrast with the NPR claim, I hear there's no significant increase in the total numbers. On the contrary, there has been a significant reduction over the past ten years – the very period the NPR uses as the basis for its threat assessment.

In July 2009, when then-principle deputy undersecretary of defense for policy Jim Miller briefed NATO on the NPR the Obama administration was preparing at the time, he told the allies that Russia had an "estimated 3-5 thousand" tactical warheads. Two years later, Miller told the US Congress that "Unclassified estimates suggest that Russia has...2,000 to 4,000...non-strategic tactical nuclear weapons."

Six years later, in February 2018, the Trump administration's NPR reported that Russia had "an active stockpile of up to 2,000 non-strategic nuclear weapons..." That's close to the estimate we have made here at FAS for the past several years. But that is not an increase but a significant reduction of more than 1,000-3,000 tactical warheads over ten years.

When I have questioned US officials about the NPR claim that Russia is increasing its non-strategic nuclear weapons, I've been told the number went up again just before the NPR was completed. That

is true, other officials have later confirmed, but they explain it was only a small increase in 2016 and that the number has not increased since. Fluctuations aside, the increase doesn't come close to making up for the total reduction over the past decade.

This discrepancy between the significant reduction of Russian tactical nuclear warheads over the past ten years and the NPR's alarming portrayal of a dangerous increase is deeply disturbing. Not only does it apparently mischaracterize what Russia is actually doing (some officials even seem to try to nudge the number up a bit to "approximately 2,000" or privately suggesting they have "over 2,000" non-strategic nuclear warheads), it seems to distort

what the US intelligence community knows, for the apparent purpose of creating political support in Congress to pay for new nuclear weapons.

That said, there is no doubt that Russia is modernizing its non-strategic nuclear weapons and introducing new or modified types; so is the United States. That is important to monitor carefully (nor is there anything benign about Russia's general military aggression and meddling in other countries' elections).

But Russia is also retiring old non-strategic nuclear weapons; it's in a transition between old and new types that creates fluctuations in the estimate. And its military strategy relies more on such weapons to compensate for Russia's inferior conventional capabilities – that has been the case for the past two decades – as well as to make up for what otherwise would be a sizeable deficit in the overall balance of Russian and US nuclear warheads (yes, the United States has more strategic weapons than Russia). ...

*Source: Hans Kristensen, <https://www.forbes.com>, 07 May 2019.*

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**BALLISTIC MISSILE DEFENCE**

**CHINA**

**China Completing More Ballistic Missile Subs, with Plans for a New Version**

China has launched two more nuclear-powered ballistic missile submarines and might fit anti-ship ballistic missiles on a new cruiser class on the verge of entering service, according to a new Pentagon report. The two new submarines will bring the number of Type 094s, or Jin-class nuclear-powered ballistic missile subs, in Chinese service to six, according to the latest annual "China Military Power Report," released May 2 by the US Défense Department. The report also said China is planning a new class of nuclear-powered ballistic missile subs, or SSBN, with construction expected to begin in the early part of the next decade.

The report confirms earlier assessments based on open-source satellite imagery published in late 2018, which showed two Type 094s under construction at the submarine yard in Huludao in the northern Chinese province of Liaoning. The Type 094 SSBN can carry up to 12 CSS-N-14 (JL-2) submarine-launched ballistic missiles, which constitute China's "first viable sea-based nuclear deterrent." The JL-2 reportedly has a range of about 4,500 miles. The follow-on SSBN-class, which the report calls the Type 096, is expected to be armed with the JL-3 sub-launched ballistic missile. The Pentagon expects China will operate its Type 096 SSBNs alongside the Type 094 boats,

based on the life of China's first-generation nuclear-powered submarines, which were in service for about 40 years.

China is also taking steps to deploy sophisticated command-and-control systems and refine associated processes to safeguard the integrity of nuclear release authority for a larger, more dispersed nuclear force, which includes road

mobile intercontinental ballistic missiles and submarine deterrence patrols. U.S. Navy officials have said since 2015 that China's People's Liberation Army Navy, or PLAN, is conducting such patrols, although there has been no official confirmation. The report also touched on the PLAN's Type 055 cruiser

capabilities, describing the type — which has been described by China as a "10,000-ton destroyer" — as "China's premier carrier escort for blue water operations." It further suggested the Type 055 will be able to launch anti-ship ballistic missiles "once these weapons are available."

As Défense News previously reported, China is about to commission its first Type 055 into PLAN service, with at least another seven in various states of construction at shipyards in Shanghai and Dalian, along with several smaller Type 052D destroyers and two domestically built aircraft carriers. The effort is part of a continuing "robust surface combatant construction program" meant to "significantly upgrade the PLAN's air defence, anti-ship, and anti-submarine capabilities," the report said.

Source: <https://www.defensenews.com>, 07 May 2019.

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**NUCLEAR ENERGY**

**RUSSIA**

**Russia's Nuclear Power Exports are Booming**

Rosatom has been using nuclear power plants as a way of cementing ties with its fellow emerging markets. Russia's state-owned agency Rosatom is on a tear. The company operates 35 nuclear power stations in Russia that produce 28 GW of power, and it is actively exporting its nuclear technology to countries around the world.

Russia has been using nuclear power plants as a way of cementing ties with its fellow emerging markets with no nuclear power tradition and the BRICS countries, a group that started as a marketing tool for Goldman Sachs to sell equity but has increasingly turned into a real geopolitical alliance amongst the leading emerging market governments.

In recent years Rosatom has completed the construction of six nuclear power reactors in India, Iran and China and it has another nine reactors under construction in Turkey, Belarus, India, Bangladesh and China. Rosatom confirmed to IntelliNews that it has a total of 19 more "firmly planned" projects and an additional 14 "proposed" projects, almost all in emerging markets around the world.

Rosatom has become the world's largest nuclear reactor builder as the financial problems of the two big Western firms Westinghouse Areva have crimped their ability to develop nuclear plants abroad. Westinghouse and Areva, now owned by EDF, have for years negotiated deals to build reactors in India but have made little progress, partly because Indian nuclear liability legislation gives reactor manufacturers less protection against claims for damages in case of accidents. The sales drive was organised by former Prime Minister Sergei Kiriyenko, who presided over Russia during the 1998 financial crisis but was

given the job of running Rosatom after leaving office and tasked with selling 40 nuclear power plants internationally.

Source: <https://www.themoscowtimes.com,09 May 2019>.

**NUCLEAR COOPERATION**

**RUSSIA-IRAN**

**Russia to Continue Nuclear Cooperation**

Russian state nuclear corporation Rosatom said its project to develop new units at Iran's Bushehr Nuclear Power Plant has not been affected by ongoing tensions arising from intensified US sanctions against Iran. Rosatom Director General Alexey Likhachov told RIA Novosti, "Rosatom has always met and is meeting all its obligations in all of its international projects."

Russian Foreign Ministry also expressed its intention to continue cooperation with Iran, despite the US

sanctions and Tehran's decision to suspend some of its obligations under the Iran nuclear agreement. The ministry said Moscow will continue to build the Bushehr plant in southern Iran and convert the Fordow uranium enrichment facility into a stable isotope production facility. "We would like to express our readiness to continue [to] cooperate with Tehran within the framework of JCPOA, as well as in other bilateral projects," the ministry said.

Source: <https://financialtribune.com, 10 May 2019>.

**NUCLEAR DISARMAMENT**

**CHINA**

China dismissed the probability of holding any trilateral talks on nuclear disarmament with the USA and Russia, which were proposed by US President Donald Trump recently. "China opposes any incidents of anybody speaking on China's

behalf and will not participate in any talks on a trilateral agreement on nuclear disarmament," Sputnik quoted Chinese Foreign Ministry's Spokesperson Geng Shuang as saying.

This comes after Trump proposed to hold talks with Russia on a new nuclear arms control treaty, adding that the negotiations could eventually include China as well. While Russia has welcomed the proposal while seeking more information, China has outrightly dismissed any

probability. This comes as both the United States and Russia have suspended their obligations towards the Cold Era-dated INF Treaty. The accord was aimed at arms control and was signed between former US President Ronald Reagan and Soviet leader Mikhail Gorbachev. The two sides agreed to destroy all cruise or ground-launched ballistic missiles with ranges between 500 and 5,500 kilometres (310 and 3,400 miles) through the signing of the treaty.

Source: <https://www.business-standard.com>, 06 May 2019.

## **GENERAL**

### **Views on Nuclear Disarmament "Wide Apart" Among NPT Signatories: UN**

A United Nations official said that there is a large convergence on the peaceful use of nuclear energy among states parties to the NPT, but not on nuclear disarmament. "There are a lot of convergence on that (peaceful use of nuclear energy)," Syed Hasrin Syed Hussin, chair of the Third Preparatory Committee for the 2020 NPT Review Conference, told a press conference. However, he said that "we can see that the views are still quite wide apart on how to move forward with regard to the implementation of Article 6, dealing with nuclear disarmament."

Hussin told reporters at the UN headquarters in New York that the world is going through "a time

of increasing international tension and deteriorating relationship between those countries that possess nuclear weapons." He said that the NPT states parties attending the Third

Preparatory Committee for the 2020 NPT Review Conference "do not agree on everything, but they have remained resolute in their commitment to the full implementation" of the treaty across all three of its pillars (non-proliferation, disarmament, and peaceful use of nuclear

energy). ...

Source: <http://www.xinhuanet.com>, 11 May 2019.

## **IRAN**

### **Iran Calls for Intensifying Efforts for Nuclear Disarmament**

Making the remarks at the preparatory committee meeting for the 2020 review conference for the Treaty on the NPT at UN headquarters in New York, Robatjazi added that the best way to stop development of nuclear weapons is the full implementation of NPT treaty and making all the countries join the agreement. Voicing Islamic Republic's strong support for international efforts toward total elimination of these weapons, he criticized the US' nuclear aid to the Israeli regime and its double standard approaches on the possession and development of atomic technology.

"The Zionist regime should be forced to join the Non-Proliferation Treaty, and bring all of its nuclear activities and facilities under the IAEA's comprehensive safeguards," he further stressed. In September 2017, then-Iranian Ambassador to the IAEA Reza Najafi denounced the West's double standard approaches on the possession and development of atomic technology, urging a complete end to any nuclear cooperation with the Israeli regime. Addressing a quarterly meeting of the IAEA's 35-member Board of Governors in Vienna, Najafi warned that the Israeli regime's

nuclear program is negatively impacting security of the Middle East.

Source: <https://en.mehrnews.com/news,09 May 2019>.

## NORTH KOREA

### 70 Countries Urge N-Korea to Scrap Nuclear Weapons

Seventy countries urged North Korea to scrap its nuclear weapons, ballistic missiles and related programs, decrying the “undiminished threat” posed to world peace. Signatories included the United States and South Korea, as well as nations in Asia, Latin America, Africa and Europe.

Russia and China, supporters of Pyongyang, did not sign the document drafted by France. With two missile launches in a week, Pyongyang is walking a fine line between increasing pressure on the US and not derailing nuclear negotiations – all while giving itself room to escalate, analysts say.

The signatories “strongly deplore the grave and undiminished threat to regional and international peace and security posed by the ongoing nuclear weapons and ballistic missiles programmes that the DPRK has developed,” the text said. “We encourage the DPRK to avoid any provocation,” it added. “We also call for the DPRK to continue discussions with the United States on denuclearization.” Pyongyang fired two short-range missiles following an earlier drill. The North had not launched any since November 2017, shortly before leader Kim Jong Un embarked on diplomatic overtures. Kim declared an end to the testing of nuclear weapons and long-range missiles during rapid rapprochement last year.

Source: <https://www.deccanherald.com, 11 May 2019>.

## NUCLEAR NONPROLIFERATION

### IRAN

#### First Anniversary of President Trump’s New Iran Strategy

One year ago, today, President Trump announced the United States would cease to participate in the Joint Comprehensive Plan of Action and would instead embark on a bold new strategy to end

Iran’s destabilizing behaviour and prevent Iran from ever acquiring a nuclear weapon. President Trump promised that America would never be held hostage to the Iranian regime’s nuclear blackmail and that we would aggressively seek to address the full range of Iran’s destabilizing activities.

One year later, President Trump has made good on his promise to counter Iran

in a comprehensive campaign of maximum pressure. We have imposed the toughest sanctions ever on the Iranian regime, designating nearly 1,000 individuals and entities in the past year. The Trump Administration has taken Iran’s oil exports to historic lows, and stopped issuing Significant Reduction Exceptions to importers of Iranian oil, effectively zeroing out purchases of Iranian crude. In May, the United States tightened restrictions that impede Iran’s ability to reconstitute its past nuclear weapons program and prevent Iran from shortening the time it would take to produce fissile material for a nuclear weapon. President Trump announced a new sanctions authority targeting trade in Iranian metals. This targets Iran’s largest non-oil related export and further degrades the regime’s ability to fund terror and instability in the Middle East.

The Iranian regime’s announcement that it intends to expand its nuclear program is in defiance of international norms and a blatant attempt to hold the world hostage. Its threat to renew nuclear work that could shorten the time to develop a nuclear weapon underscores the continuing challenge the

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Iranian regime poses to peace and security worldwide.

The United States is committed to denying the Iranian regime all paths to a nuclear weapon. We will continue to impose maximum pressure on the regime until it abandons its destabilizing ambitions. We call on the international community to hold the Iranian regime accountable for its threat to expand its nuclear program.

**The European Union passed new sanctions against Iranian entities in response to two foiled terror plots last year. Other nations have responded to Iran's malign activity by recalling ambassadors, expelling Iranian diplomats, eliminating visa-free travel, or denying landing rights to Mahan Air.**

America is not countering Iran alone. Since our withdrawal from the deal, our allies and partners have stepped up to counter Iranian aggression with us. We have acted with countries from nearly every continent to disrupt Iran's illicit oil shipping operations. The European Union passed new sanctions against Iranian entities in response to two foiled terror plots last year. Other nations have responded to Iran's malign activity by recalling ambassadors, expelling Iranian diplomats, eliminating visa-free travel, or denying landing rights to Mahan Air. Moving forward, we will continue to build on the already significant successes of our pressure campaign. As outlined in the 12 demands in my May 21, 2018 speech, we will continue to apply maximum pressure on the Iranian regime until its leaders change their destructive behaviour, respect the rights of the Iranian people, and return to the negotiating table.

Source: <https://www.state.gov>, 08 May 2019.

**NUCLEAR PROLIFERATION**

**GENERAL**

**How to Dismantle the Absurd Profitability of Nuclear Weapons**

*The Bulletin of the Atomic Scientists* currently has its Doomsday Clock set to two minutes to midnight — the closest we've been to self-obliteration in

nuclear history. But nuclear weapons are more than just a terrifying threat to every living thing on earth. For decades, they've been a terrific way to make money. A new report from PAX, a Dutch peace organization, both illuminates how profitable it can be for multinational corporations to manufacture Armageddon and provides a roadmap for taking the money out of mass death.

The PAX report identifies a total of \$116 billion in current contracts between governments and the private sector to design, build, and maintain the world's nuclear arsenals. The actual amount may be significantly higher, since all nine nuclear powers maintain some degree of opacity about their nuclear programs. "We know what we can trace," says Susi Snyder, the report's principal author, "but there's definitely more out there."

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Many powerful corporations therefore have incentives to push governments to expand their nuclear stockpiles. At a recent investor conference, a managing director of the investment bank Cowen Inc. questioned the CEO of Raytheon, one of the nuclear contractors listed by PAX. "We're about to exit the INF with Russia," the managing director said, and excitedly asked if this means that "we will really get a defense budget that will really benefit Raytheon." (The planet may be destroyed, but for a beautiful moment in time, they will have created a lot of value for shareholders.)

Snyder believes that President Donald Trump's decision to pull out of the INF Treaty may be paying literal dividends for Raytheon already. She points out that over a period of three months after Trump announced the U.S. withdrawal last fall, Raytheon received an anomalous 44 separate missile contracts worth more than \$500 million.

Moreover, corporate lobbying has already nudged the U.S. to commit to a nuclear “modernization” program — initiated under former President Barack Obama and expanded under Trump — that will cost an estimated \$1.2 trillion over the next 30 years. And while modernization sounds good, what’s planned will actually make U.S. nukes much more deadly, something to which Russia is already planning to respond. The final result may be an extremely modern nuclear war. PAX, however, does not counsel despair, but instead sees the intertwining of the private sector and nuclear weapons as a potential point of leverage.

The five largest known current beneficiaries of nuclear weapons spending are all U.S.-based multinationals: Huntington Ingalls Industries (\$29.9 billion), Lockheed Martin (\$25.2 billion), Honeywell International (\$16.5 billion), General Dynamics (\$5.8 billion), and Jacobs Engineering (\$5.3 billion).

The report also identifies large nuclear contracts with companies elsewhere. Airbus, headquartered in the Netherlands, develops nuclear-armed missiles for France. A British company called Serco has a 25-year contract to help manage and operate the U.K. Atomic Weapons Establishment, the center of the United Kingdom’s nuclear program. Bharat Dynamics Limited in Hyderabad helps make two of India’s nuclear-capable missiles.

Among the hundreds of nuclear contracts are some gems of nuclear insanity. Boeing has received \$16 million to develop a “Flight Termination Receiver” that would theoretically allow nuclear missiles to be destroyed after a mistaken launch.

This could change the U.S. nuclear calculus in an extremely dangerous way. There have been many false alarms in the past that Russian missiles were headed toward the U.S. We’re here now only because no president responded to the alarms,

in part because they knew such a response would be irrevocable. If future presidents believe that they have an end of the world “take back,” they may be tempted to launch U.S. nuclear missiles in response to another false alarm. But of course, no technology is ever 100 percent effective — especially when it’s built by

the company that brought us the 737 Max. And if just one missile failed to self-destruct, a full-out nuclear war would soon follow.

That’s the bad news. Here’s the qualified good news. PAX is a member of the ICAN. ... ICAN’s strategy with the TPNW is a sneaky one. They do not aim to begin by trying to persuade countries

with nuclear weapons to abandon them. Rather, they aim to start by persuading non-nuclear countries to ratify the treaty. Such countries will then be prohibited from possessing nuclear weapons — and from allowing them to transit through them or permitting their production on their territory.

If all goes according to plan, this will create a slowly tightening noose around the nuclear weapons states. If the Netherlands were to ratify TPNW, Airbus could no longer help build France’s nuclear missiles. The Italian company Leonardo also lends a hand with France’s nuclear program and likewise could not do so if Italy ratifies the treaty.

But beyond legal restrictions, ICAN hopes that

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grassroots organizing for TPNW country by country will eventually create a societal taboo around nuclear weapons that will put severe pressure on private-sector corporations and eventually the current nuclear states. If this sounds utopian, it should be remembered that such taboos have been created around biological and chemical weapons, as well as land mines and cluster bombs. There are still holdout countries for each, but they've faced greater and greater opprobrium as time goes by, and it's not impossible to imagine that there will be eventual complete compliance in each case.

PAX points out that the TPNW has already helped create enough stigma surrounding nuclear weapons that two enormous pension funds have divested from nuclear arms producers. The Norwegian Government Pension Fund, the second-largest pension fund on earth, has sold its investments in, among other companies, Huntington Ingalls, Lockheed Martin, Airbus, and Boeing. The Dutch civil service fund ABP is the world's fifth-largest and has also divested from the nuclear arms industry. ...

This perspective is now quietly making its way across the Atlantic. This January, a bill was introduced in the Massachusetts State Legislature that would require the state's pension funds to divest from nuclear manufacturers. The city of Cambridge has already done so. Ojai, California, will not make any future investments in the makers or funders of nuclear weapons. ... And that's the point of Pax's report: It wasn't created for passive consumption, but to put basic information in the hands of activists, so that they can exert the power of basic sanity.

*Source: Jon Schwarz, <https://theintercept.com>, 04 May 2019.*

### **NORTH KOREA**

#### **What Geology Reveals about North Korea's Nuclear Weapons – and What it Obscures**

North Korea's leader, Chairman Kim Jong Un, clearly is in no hurry to demilitarize his country. In the wake of two historic yet unproductive summits with President Trump, Kim made a state visit in

April to Moscow, where he made clear that his country will not give up its nuclear weapons without international security guarantees. North Korea also tested what appeared to be short-range missiles on April 18 and May 4.

These tests are reminders that North Korea's military forces, particularly its nuclear arsenal, pose a serious threat to the United States and its Asian allies. This reclusive nation is a high-priority U.S. intelligence target, but there are still large uncertainties about the power of its nuclear weapons. North Korean scientists work in isolation from the rest of the world, and defectors are far and few between.

My research focuses on improving techniques for estimating the yield, or size, of underground nuclear explosions by using physics-based simulations. Science and technology give us a lot of tools for assessing the nuclear capabilities of countries like North Korea, but it's still difficult to track and accurately measure the size and power of their nuclear arsenals. Here's a look at some of the challenges.

***A Nation in the Dark:*** For an isolated nation like North Korea, developing a functional nuclear weapons program is a historic feat. Just eight other sovereign states have accomplished this goal – the five declared nuclear weapons states plus Israel, India and Pakistan.

North Korea has been developing nuclear weapons since the mid-1980s. Paradoxically, in 1985 it also joined the NPT, under which it pledged not to develop or acquire nuclear weapons. But by 2002, U.S. intelligence discovered evidence that North Korea was producing enriched uranium – a technological milestone that can yield explosive material to power nuclear weapons. In response the U.S. suspended fuel oil shipments to North Korea, which prompted the North to leave the NPT in 2003.

Then the North resumed a previously shuttered program to extract plutonium from spent uranium fuel. Plutonium-based nuclear weapons are more energy-dense than uranium-based designs, so they can be smaller and more mobile without

sacrificing yield. North Korea conducted its first nuclear test on Oct. 6, 2006. Many experts considered the test to be unsuccessful because the size of the explosion, as determined from seismograms, was relatively small. However, that conclusion was based on incomplete information. And the test still served as a powerful domestic propaganda tool and international display of might.

**More Tests, More**

**Uncertainty:** Since 2006 North Korea has conducted five more nuclear tests, each one larger than the last. Scientists are still working to measure their yield accurately. This question is important, because it reveals how advanced the North Korean nuclear program is, which has implications for global security.

Estimates of the size of North Korea's most recent test in September 2017 place it between 70 and 280 kilotons of TNT equivalent. For reference, that's five to 20 times stronger than the bomb that was dropped on Hiroshima. In fact, the explosion was so strong that it caused the mountain under which it was detonated to collapse by several meters.

We have a variety of tools for gaining knowledge about these events, ranging from satellite imagery to radar and seismograms. These methods give us an idea of North Korea's capabilities, but they all have drawbacks. One difficulty common to all of them is uncertainty about geological conditions at the test site. Without a good understanding of the geology, it's difficult to accurately model the explosions and replicate observations. It is even harder to constrain the error associated with those

estimates.

Another, less understood phenomenon is the effect of fracture damage at the test site. North Korea has conducted all of its nuclear tests at the same location. Field experiments have shown that such repeat tests dampen the outgoing seismic and infrasound waves, making the explosion appear weaker than it actually is. This happens because the rock that was fractured by the first explosion is more loosely held together and acts like a giant muffler. These processes are poorly understood and contribute to even more uncertainty.

Additionally, my research and work by other scientists have shown that many types of rock enhance the production of earthquake-like seismic waves by underground explosions. The more energy from an explosion that gets converted into these earthquake-like waves, the more difficult it becomes to estimate the size of the explosion.

**What Do We Know?** What U.S. officials do know is that North Korea has an active nuclear weapons program, and any such program poses an existential threat to the United States and the world at large. Intelligence experts in South Korea and

nuclear scientists in the United States estimate that North Korea has between 30 and 60 nuclear weapons in reserve, with the ability to produce more in the future. It's still unclear how far North Korea can deliver nuclear weapons. However, their ability to produce plutonium enables them to make small, easily transportable nuclear bombs, which increase the threat.

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In the face of such developments, one course of action available to the U.S. that would serve our country's national security interests is to negotiate with North Korea in good faith, but accept nothing less than complete nuclear disarmament on the Korean peninsula. And any such agreement will have to be verified through disclosures and inspections to ensure that North Korea doesn't cheat.

That's impossible if U.S. experts don't have an accurate accounting of what the North has achieved so far. The more that Americans negotiators know about Pyongyang's nuclear activities to date, the better prepared they will be to set realistic terms if and when North Korea decides – as other nations have – that its future is brighter without nuclear weapons.

Source: <http://theconversation.com>, 07 May 2019.

### NUCLEAR SECURITY

#### LATIN AMERICA AND CARIBBEAN

##### **IAEA Kicks Off New Phase of Project Strengthening Regulatory Infrastructure for Radiation Safety and Nuclear Security in Latin America and the Caribbean**

The recently launched second phase of the IAEA Regulatory Infrastructure Development Project (RIDP) in Latin America and the Caribbean aims to help 14 countries strengthen national regulatory infrastructure for radiation safety and nuclear security, almost twice as many as the first phase in 2017. From 23 to 26 April, representatives from the participating countries analysed lessons learned and agreed on future activities. Representatives of countries that took part in the first phase – Chile, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Paraguay and Uruguay – were joined by representatives from countries that are new to the second phase: Bolivia, Colombia, the Dominican Republic, Honduras, Panama and Peru.

"The project will help participating countries use radioactive sources safely and securely by supporting them as they develop regulatory

infrastructure that is strong enough to handle any needs that arise," said Hilaire Mansoux, Head of the IAEA's Regulatory Infrastructure and Transport Safety Section, in his opening remarks. Participants agreed that project activities should help introduce or strengthen procedures and systems to safely and securely handle and control radioactive sources used in medicine, industry and research. Almost half of the 130 regulatory staff involved in the first phase of the project are female – reflecting emphasis on gender parity in all project activities.

**Hand in Hand: Safety and Security:** "The project addresses both security and safety in a harmonised approach that is tailored to States' needs and is consistent with the IAEA Nuclear Security Plan," said Muhammed Khaliq, Head of the IAEA's Nuclear Security of Materials and Facilities Section.

Project activities will involve different IAEA resources, including expert missions, regional and national trainings and advisory missions. The activities will offer the countries taking part support in areas related to the national policy for safety and security, safety and security regulatory framework, authorization and inspection, physical protection and management systems. The new project complements assistance provided by the IAEA through national and regional technical cooperation projects to strengthen regulatory infrastructure for radiation safety.

**Learning from Experience:** "Thanks to this assistance, El Salvador made significant progress towards strengthening its regulatory infrastructure, which is now more in line with the IAEA international standards and guidance," said Carolina Escobar de Rivera, Director of Radiological Protection at El Salvador's Ministry of Public Health and Social Assistance.

Participants from all countries reported on the progress in their ability to regulate activities such as radiology, nuclear medicine, radiotherapy, industrial radiography, industrial irradiators, nuclear gauges and well logging in line with the IAEA Safety Standards, the Nuclear Security Series

and the Code of Conduct on Safety and Security of Radioactive Sources and its supplementary guidance documents. The new phase will benefit from recently introduced activities targeting young regulators, integrated management systems, and skills in authorization and inspection. ...

Source: <https://www.iaea.org>, 08 May 2019.

**USA**

**Nuclear Security Funding Cuts in Future**

For the third year in a row, the Trump administration is proposing to reduce funding for core U.S. nuclear security and non-proliferation programs at the semiautonomous National Nuclear Security Administration (NNSA). The fiscal year 2020 budget request has prompted concerns from experts and lawmakers who have warned of persistent threats of nuclear terrorism and diminishing international attention to nuclear security.

Even NNSA Administrator Lisa Gordon-Hagerty suggested that the submission is insufficient, telling a congressional committee last month that she would gladly take additional funds above the budget request "to secure more nuclear materials around the world because that's nuclear materials that are less likely to fall in the hands of terrorists or adversaries." The Trump administration is asking for \$1.3 billion for core nuclear security and non-proliferation programs at the NNSA next year, a decrease of about \$100 million, or 7 percent, from the fiscal year 2019 appropriation.

When measured against what the NNSA said it would request for these programs during the last year of the Obama administration, the fiscal year 2020 proposal is more than \$200 million less than

projected. The largest proposed reduction in the request is to the Global Material Security program, which has the task of improving the security of nuclear materials around the world, securing orphaned or disused radiological sources, and strengthening nuclear smuggling detection and deterrence. The program would get \$342 million, a \$65 million reduction from the fiscal year 2019 appropriation.

According to budget documents, the decline from the enacted level reflects "a return to the baseline budget" after one-time from Congress in fiscal year 2019 to programs addressing domestic and international radiological material security and nuclear smuggling. Asked at a House Armed Services Committee hearing on April 9 what the NNSA could do with an additional \$80 million for international nuclear security programs, Gordon-Hagerty said the agency could acquire additional cesium blood irradiators, undertake "additional training around the world," and help other countries with "security installations."

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The Material Management and Minimization program, which supports the removal of civilian HEU and plutonium around the world and converts HEU-fuelled research reactors and medical isotope production facilities to the use of low-enriched uranium, would receive \$334 million, a decrease of \$59 million from the fiscal year 2019 appropriation. The budget request would increase funding slightly for non-proliferation and arms control activities from a fiscal year 2019 appropriation of \$130 million to \$137 million. Spending for non-proliferation research and development activities, which focus on

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**The budget request would increase funding slightly for non-proliferation and arms control activities from a fiscal year 2019 appropriation of \$130 million to \$137 million. Spending for non-proliferation research and development activities, which focus on technologies used in tracking foreign nuclear weapons programs, illicit diversion of nuclear materials, and nuclear detonations, would rise to \$495 million from its \$477 million fiscal year 2019 appropriation.**

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Experts and lawmakers are questioning the wisdom of the proposed reductions in funding for NNSA nuclear and radiological security activities. A policy brief from Harvard University's Managing the Atom Project published in April argued that the "budget request for programs to reduce the dangers of nuclear theft and terrorism is too small to implement the ambitious approach that is needed." Although past U.S. efforts to improve nuclear security around the world have been highly successful, the brief notes, "momentum is slowing, raising serious doubts as to whether national leaders are fulfilling their commitment to continue to make nuclear security a priority." Rep. Marcy Kaptur (D-Ohio), the chairwoman of the House energy and water appropriations subcommittee that oversees the NNSA's nuclear weapons and non-proliferation work, expressed concern at an April 2 hearing on the NNSA budget request "that the administration is taking its foot off the gas pedal with respect to key non-proliferation programs."

During the first two years of the Trump administration, Congress provided almost \$300 million more than what the administration requested for core NNSA nuclear security and non-proliferation programs. Elsewhere in the NNSA non-proliferation budget, the administration is requesting \$220 million to close down the controversial MOX fuel facility and \$79 million to support an alternative strategy to dispose of 34 metric tons of surplus plutonium from the U.S. nuclear weapons program. The MOX fuel facility, designed to turn the surplus material into fuel for civilian power reactors, has been plagued by major

cost increases and schedule delays. The Energy Department has sought to end the program since 2014 in favour of a cheaper alternative, known as dilute and dispose. That process would down-blend the plutonium with an inert material for direct disposal at the deep-underground Waste Isolation Pilot Plant in New Mexico. The NNSA estimated last year that the dilute-and-dispose process would cost \$19.9 billion, or 40 percent of the \$49.4 billion cost of continuing the MOX fuel program.

Source: <https://www.armscontrol.org>, May 2019.

## **NUCLEAR SAFETY**

### **CHINA**

#### **Chinese Scientists Develop Virtual Nuclear Power Plant for Safety Assessment**

Chinese scientists have developed a virtual nuclear power plant within a digital society, a software program to help evaluate the safety and efficiency of nuclear energy systems. The research of the system, named Virtual4DS, was published as a cover paper in the International Journal of Energy Research in April. Nuclear safety is a key issue in the development of nuclear energy. Advanced numerical simulations can restore the complex physical processes as much as possible and predict nuclear energy system behaviour and safety

performance.

Developed by scientists from the Institute of Nuclear Energy Safety Technology under the Chinese Academy of Sciences, the system uses information technology to establish an integrated simulation platform for the whole environment of the nuclear power plant. It can analyse nuclear reactor safety, radiation safety and environmental impact, providing a research tool for nuclear

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safety design and assessment, accident warning, emergency decision-making and social risk assessment. Virtual4DS can be connected to a nuclear power plant's information system, and its core modules have been applied in nuclear engineering projects such as ITER, the world's largest nuclear fusion experimental reactor, and China's Lead-based Reactor, according to the team. According to Wu Yican, the lead researcher, the system not only focuses on the safety of the reactor itself but also the relationship between nuclear safety and the environment, as well as the relationship between nuclear safety and the public.

The system combines the internet of things, cloud computing, artificial intelligence, big data, and other advanced information technologies. "An important trend is to perform nuclear reactor design and safety assessment through massive data mining and AI analysis of the nuclear reactor data, weather data, earthquake data, geology and hydrogeological data, public sentiment data and so on," Wu said. Wu's team

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has proposed "nuclear informatics" firstly by combining nuclear science and informatics, taking advantage of information technology focusing on the requirements of nuclear energy development. Many key technologies are developed under the guidance of nuclear informatics. Wu said China has seen fast development of the nuclear power industry. In addition to the development of nuclear power equipment technology, the research and development of core independent software is also a top priority. ...

Source: <https://eng.belta.by>, 10 May 2019.

## **MOROCCO-RWANDA**

### **Morocco, Rwanda Ink MoU in the Field of Nuclear Safety & Security**

The Moroccan Agency for Nuclear and Radiological Safety and Security (AMSSNuR) and Rwanda Utilities Regulatory Agency (RURA) have signed a MoU for cooperation and development

in radiological, nuclear safety and security. The MoU was signed by the Director General of AMSSNuR, Khammar Mrabit, and RURA's Director General Patrick Nyirishema.

This 5-year cooperation MoU focuses on the exchange of information and experiences on the regulation of nuclear safety and nuclear waste management. It also covers the management of radiological and nuclear emergencies, as well as training and capacity building in the field of nuclear and radiological safety. According to AMSSNuR's Director General, the MoU aims to strengthen cooperation between the two countries in a key area affecting strategic sectors such as medicine, agriculture, industry and mining.

He said the exchange of information and experiences on nuclear and radiological security will strengthen the capabilities and expertise of both countries and help to promote bilateral cooperation. He recalled that Morocco has already achieved "major breakthroughs" in the field by setting up a legislative and regulatory framework in collaboration with the IAEA and American and European partners.

... For his part, RURA director general said that Rwanda aims to use nuclear technology mainly in the fields of mining, agriculture and health, stressing that Rwanda seeks to learn from the experience of Morocco. He also said that Rwanda is preparing to set up a nuclear research centre in the next five years with nuclear reactors to use atomic industry in several strategic sectors.

Source: <http://northafricapost.com>, 10 May 2019.

## **NUCLEAR WASTE MANAGEMENT**

### **USA**

A trio of US senators took a third swing at legislation that would remove management of the federal nuclear waste program from the Department of Energy in hopes of finally driving it forward. The 2019 version of the Nuclear Waste Administration Act appears identical to the

iterations of the bill introduced in 2013 and 2015. Both those measures died in committee. "Our bipartisan legislation will ensure the federal government finally fulfils its obligation to address the back-end of the fuel cycle. I thank my colleagues for once again coming together to lead on this important issue, and look forward to holding a hearing on this legislation in the near future," Sen. Lisa Murkowski (R-Alaska), who sponsored the bill with Sens. Lamar Alexander (R-Tenn.) and Dianne Feinstein (D-Calif.), said in a press release.

**The Department of Energy legally is on the hook for disposing of what is now roughly 100,000 metric tons of spent fuel from commercial nuclear power reactors and high-level radioactive waste from defence nuclear operations. The department does not yet have a license for its preferred repository at Yucca Mountain, and the licensing proceeding has been defunded for the better part of a decade.**

If approved in this Congress, the legislation would, among other things: establish a new federal organization responsible for siting, licensing, building, and operating waste facilities; require local consent in siting such facilities, almost certainly putting a final stop to the planned Yucca Mountain repository in Nevada; require construction of a pilot storage facility for priority waste, at least one storage site for nonpriority waste, and at least one permanent repository for the waste; and keep the door open for separate

disposal sites for commercial and defence waste.

The recommendations are derived from the 2012 recommendations of the Obama administration's Blue-Ribbon Commission on America's Nuclear Future. Murkowski, Feinstein, and Alexander were among the sponsors for the 2013 and 2015 bills. The Department of Energy legally is on the hook for disposing of what is now roughly 100,000 metric tons of spent fuel from commercial nuclear power reactors and high-level radioactive waste from defence nuclear operations. The department does not yet have a license for its preferred repository at Yucca Mountain, and the licensing proceeding has been defunded for the better part of a decade. Two corporate teams are seeking Nuclear Regulatory Commission licenses for facilities that could consolidate the used fuel until the repository is ready.

Source: <https://www.exchangemonitor.com>, 01 May 2019.



Centre for Air Power Studies

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

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