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OPINION – Manpreet Sethi

Perceptions of India’s Nuclear Capability Build-up: Ghost Hunting and a Reality Check

The basic philosophy of nuclear deterrence in India has not changed, despite recent arguments. Before India conducted its nuclear tests in 1998, its nuclear intentions were a matter of widespread speculation. Subsequent to the declaration of a doctrine (as a draft in 1999 and then through a press note on 2003) clearly spelling out attributes of its nuclear strategy, conjectures continue to be made on its capability trajectory. Will India stick to minimum deterrence? Is it moving beyond a strategy of deterrence by punishment premised on counter-value retaliation to developing capabilities that can allow counterforce targeting? Will India then give up its NFU doctrine?

Culling out statements of a few prominent Indians, who *once* occupied important positions in nuclear decision making, some analysts question whether India remains committed to credible minimum deterrence and NFU. Two such recent articles have appeared. One of them is entitled “India’s Counterforce Temptations: Strategic Dilemmas, Doctrine and Capabilities.” Co-authored by Christopher Clary and Vipin Narang, it asserts that India is developing nuclear

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capability beyond what is required for retaliation and moving towards pre-emptive counterforce options, particularly against Pakistan. Another article that contends that India is developing nuclear counterforce options that extend beyond its commitment to credible minimum deterrence is co-authored by Frank O'Donnell and Debalina Ghoshal entitled “Managing Indian Deterrence: Pressures on Credible Minimum Deterrence and Nuclear Policy Options.”

While each scholar and practitioner is entitled to his or her views, a few facts need to be highlighted before a judgment is passed on the kind of nuclear capability development India is

undertaking. This reflection is necessary because such conclusions can have repercussions on an adversary's arsenal build up. In any case, antagonists assume the worst of each other. Analyses that rest on conjectures of capability and are prefaced with phrases such as "most likely," "potentially," and "if" could set nations down paths that create more security dilemmas than address them. The general argument being made in such articles is that India is developing a suite of capabilities and increasingly voicing statements in favour of pre-emption and counterforce, thereby revealing a lack of strategic confidence in current nuclear policies.

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This assertion is a bit difficult to fathom since no serving government official has expressed any such change. Rather, a recent statement on India's nuclear capability was made in October last year when Indian Prime Minister Narendra Modi announced the first operational patrol of INS *Arihant*. He used the occasion, in fact, to reiterate India's commitment to credible minimum deterrence and no first use. The import of this statement cannot be missed coming as it does from the head of the Political Council of India's Nuclear Command Authority. When the sitting prime minister of the country has chosen to make no reference to India moving towards a pre-emptive and counterforce nuclear posture, then should it be so concluded on the basis of statements of some individuals, who certainly matter because of the chairs that they once occupied, but who are currently not in the official loop? Of course, they may be speaking from their conviction on what India's nuclear strategy should be and might have a view different from the official policy. But that does not make

All attributes of its nuclear doctrine are geared for ensuring the least possibility, if not obviation, of nuclear use. By professing NFU with massive retaliation, the country is signalling that it will not place the adversary on the edge of the 'use or lose' dilemma that forces him into a nuclear use decision. The onus of escalation is left to the adversary, but his hand is stayed from the nuclear trigger by the promise of massive retaliation.

it *the* Indian position or indicate a change in official policy.

Secondly, suggestions which contend that India's capability developments are inching toward counterforce targeting so as to build a "limited capability to disarm Pakistan" beg a crucial question. Can a limited disarming of Pakistan's

nuclear weapons help India avert retaliation from the left-over arsenal? What would India gain by such a pre-emptive attack that only partially cripples the adversary's arsenal, while inviting use of nuclear weapons upon itself? The proponents of this view

answer these questions by pointing to India's research and development efforts aimed at development of ballistic missile defense. The two put together, it is argued, could ensure damage limitation and thus embolden India to undertake first strike against Pakistan. The recent anti-

satellite test by India, and its linkage with ballistic missile defense technologies, would also be seized to make a similar case. Such arguments fail to consider, or are dismissive of, India's basic philosophy towards nuclear weapons.

Since 1998, India has claimed a deterrent role for its nuclear weapons and has eschewed the idea of

fighting a nuclear war. The very act of acquisition of nuclear weapons by India was premised on creating deterrence so that these weapons *do not come into play*. All attributes of its nuclear doctrine are geared for ensuring the least possibility, if not obviation, of nuclear use. By professing NFU with massive retaliation, the country is signalling that it will not place the adversary on the edge of the 'use or lose' dilemma that forces him into a nuclear use decision. The onus of escalation is left to the

adversary, but his hand is stayed from the nuclear trigger by the promise of massive retaliation. For minds brought up on the idea of fighting a protracted war with nuclear weapons, the concept of massive retaliation is even more unpalatable. They seem convinced that a counter value targeting strategy following Pakistan's use of nuclear weapons on the battlefield cannot be credible.

Hence, there is an automatic assumption that counterforce, proportionate response options will be explored by India. This hypothesis, however, yet again refuses to consider, or give adequate weight, to the Indian understanding that nuclear weapons are dramatically different from conventional weapons and so, their use cannot be conceived of in the same manner.

Articles that tend to accord pre-emptive counterforce capabilities to India and suspect its loyalty to the stated doctrine overlook the overall approach of India to nuclear weapons. This is not surprising given that the Indian view is not a predominant one among the current set of nuclear strategies of other nuclear armed states. This makes it prone to misunderstanding. But, calculations of changes in India's doctrine based only on statements of few retired individuals, or on the basis of *potential* capability developments as evinced from few tests, may lead to misleading conclusions. India certainly has the right and the responsibility to explore all options for its national security. The defense and scientific establishment will remain engaged in this effort, as is the case with all other nations. But, to impute motives to such efforts without taking into account the doctrinal underpinnings amounts to ghost hunting.

Meanwhile, in case the surmise of these articles is indeed correct and India is engaged in building pre-emptive counterforce nuclear capabilities, then the nuclear decision makers need to be reminded of the dangers and inefficacy of using

nuclear weapons as warfighting instruments. The country must not delude itself into believing that counterforce capabilities along with BMD can help it escape nuclear retaliation. Secure second strike capabilities are available with both its nuclear armed neighbours. No matter how good the Indian intelligence-surveillance-reconnaissance capability complex is and how big the first strike might be, a disarming attack can still not be guaranteed. Therefore, it would be wisest to invest in nuclear deterrence building in such a manner as to signal massive retaliation in case of nuclear use, irrespective of its nature, yield or target. Fighting a nuclear war in instalments could prove to be very costly — materially and in human terms.

In an age of maximalist nuclear noise, India will need a lot of maturity and courage to hold on to the philosophy of minimum deterrence. One way

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in which India could avoid temptations and make considered nuclear choices is if it does not forget some basics of nuclear weapons: the reality that these *are* weapons in a category of their own. The reason that they have never been used since 1945 and why a nuclear taboo against their use exists is because of their high damage potential. Instantaneous

release of large amounts of energy in the form of blast and thermal heat, ionizing radiation, as well as long-term radiation from nuclear fallout are natural attributes of every nuclear explosion.

Given this nature, they are best suited as punishment weapons, not the kinds that can facilitate rational war aims. Having war gamed all kinds of targeting strategies, the United States and Russia reached a conclusion in the late 1980s that there is nothing like a "limited nuclear war" and that there can be no mini or micro nuclear weapon that could be used *conventionally*. In the context of Southern Asia, given its density of populations, there can be no nuclear attacks carried out with surgically precise accuracy that can make them

acceptable. Nuclear decision-making cannot afford to lose sight of these basics. Temptations to build capabilities that seem to hold out the promise of limited nuclear war by confining attacks to counterforce targets can only be illusory, even downright dangerous. This would amount to ghost hunting too.

Source: <https://thediplomat.com>, 02 April 2019.

OPINION – Daryl G. Kimball

The NPT and the Conditions for Nuclear Disarmament

Fifty years ago, shortly after the conclusion of the 1968 NPT, the US and the Soviet Union launched the SALT. Negotiated in the midst of severe tensions, the SALT agreement and the ABM Treaty were the first restrictions on the superpowers' massive strategic offensive weapons, as well as on their emerging strategic defensive systems. The SALT agreement and the ABM Treaty slowed the arms race and opened a period of U.S.-Soviet detente that lessened the threat of nuclear war. Further progress on nuclear disarmament by the US and Russia has been and remains at the core of their NPT Article VI obligation to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament."

But as the 2020 NPT Review Conference approaches, the key agreements made by the world's two largest nuclear powers are in severe jeopardy. Dialogue on nuclear arms control has been stalled since Russia rejected a 2013 U.S. offer to negotiate nuclear cuts beyond the modest reductions mandated by the 2010 New START. More recently, the two sides have failed to engage in serious talks to resolve the dispute over Russian compliance with the 1987 INF Treaty, which will likely be terminated in August. Making matters worse, talks on extending New START, which is due to expire in 2021, have not begun. In 2018, Russia said it was interested in extending

New START, but Team Trump will only say it remains engaged in an interagency review of the treaty. That review is led by National Security Advisor John Bolton, who publicly called for New START's termination shortly before he joined the administration.

New START clearly serves U.S. and Russian security interests. The treaty imposes important bounds on the strategic nuclear competition between the two nuclear superpowers. Failure to extend New START, on the other hand, would compromise each side's understanding of the others' nuclear forces, open the door to unconstrained nuclear competition, and undermine international security. Agreement to extend New START requires the immediate start of consultations to address implementation concerns on both sides. Instead of agreeing to

Agreement to extend New START requires the immediate start of consultations to address implementation concerns on both sides. Instead of agreeing to begin talks on a New START extension, U.S. State Department officials claim that "the U S remains committed to arms control efforts and remains receptive to future arms control negotiations" but only "if conditions permit."

begin talks on a New START extension, U.S. State Department officials claim that "the U S remains committed to arms control efforts and remains receptive to future arms control negotiations" but only "if conditions permit." Such arguments ignore the history of how progress on disarmament has been and can be achieved. For

example, the 1969–1972 SALT negotiations went forward despite an extremely difficult geostrategic environment.

As U.S. and Russian negotiators met in Helsinki, President Richard Nixon launched a secret nuclear alert to try to coerce Moscow's allies in Hanoi to accept U.S. terms on ending the Vietnam War, and he expanded U.S. bombing into Cambodia and Laos. Meanwhile, the Soviet Union sent 20,000 troops to Egypt to back up Cairo's military campaign to retake the Sinai Peninsula from Israel. In late 1971, Nixon risked war with the Soviet Union and India to help put an end to India's 1971 invasion of East Pakistan. Back then, the White House and the Kremlin did not wait until better conditions for arms control talks emerged. Instead, they pursued direct talks to achieve modest arms control measures that, in turn, created a more stable and predictable

geostrategic environment.

Today, U.S. officials, such as Christopher Ford, assistant secretary of state for international security and non-proliferation, argue that the NPT does not require continual progress on disarmament and that NPT parties should launch a working group to discuss how to create an environment conducive for progress on nuclear disarmament.

Dialogue between nuclear-armed and non-nuclear-weapon states on disarmament can be useful, but the U.S. initiative titled "Creating an Environment for Nuclear Disarmament" must not be allowed to distract from the Trump administration's lack of political will to engage in a common-sense nuclear arms control and risk reduction dialogue with key nuclear actors. The current environment demands a

productive, professional dialogue between Washington and Moscow to extend New START by five years, as allowed by Article XIV of the treaty; to reach a new agreement that prevents new deployment of destabilizing ground-based, intermediate-range missiles; and maintain strategic stability and reduce the risk of miscalculation. Ahead of the pivotal 2020 NPT Review Conference, all states-parties need to press U.S. and Russian leaders to extend New START and pursue further effective measures to prevent an unconstrained nuclear arms race. Failure to do so would represent a violation of their NPT Article VI obligations and would threaten the very underpinnings of the NPT regime.

Source: <https://www.armscontrol.org>, 01 April 2019.

OPINION – Robert Green

The New Nuclear Deterrence and Disarmament Crisis

We are violating the fundamental principles of MAD – and there seems to be a lack of awareness, let alone alarm, about this in mainstream western commentaries. Bottom of Form

The author's book titled *Security without Nuclear Deterrence*, a new edition of which was published in 2018 in the UK, explains his gradual rejection of pro-nuclear deterrence indoctrination as a former operator of British nuclear weapons.

The Naked Nuclear Emperor: In it, the author chronicle how the US politico-military-industrial complex, drawing the wrong lessons from Hiroshima and Nagasaki and in denial about the horrors it had unleashed on humanity, seized upon the bogus mantra of nuclear deterrence to play upon people's fears and justify sustaining the unaccountable, highly profitable scientific and military monster spawned by the Manhattan Project.

Since then the principal guardians of nuclear deterrence – the western group comprising the US, UK and France – have struggled to provide intellectual coherence as endless adjustments to the

theory and doctrine were made to accommodate the latest expansion of the nuclear arms race it had unleashed. Uncritical repetition by posturing political leaders, careerist experts and mainstream media of simplistic soundbites gave it the aura of a state religion, to the point where it echoed the fable of the emperor with no clothes. Nuclear deterrence is based upon a crazy premise: that

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Uncritical repetition by posturing political leaders, careerist experts and mainstream media of simplistic soundbites gave it the aura of a state religion, to the point where it echoed the fable of the emperor with no clothes. Nuclear deterrence is based upon a crazy premise: that nuclear war can be made less probable by making it more probable.

nuclear war can be made less probable by making it more probable. Worse, it is bedevilled by two insurmountable contradictions:

* A rational leader cannot make a credible nuclear threat against an adversary capable of an invulnerable retaliatory 'second strike'.

* Yet a second strike would be no more than posthumous revenge.

Moreover, unlike conventional war, following nuclear war – amid millions of dead and untreatable survivors, radioactive poisoning and apocalyptic destruction – the smoke alone from firestorms over cities in a nuclear war in South Asia would blot out the sun around the entire northern hemisphere, causing massive crop failure and global famine.

Recently, the groundless claim that nuclear weapons prevent war between nuclear-armed states was yet again challenged in the latest clashes between India and Pakistan, whereupon

anxious nuclear powers led by the US and China had to intervene to restrain them. India and Pakistan naively followed their former colonial master's insistence that nuclear deterrence held the key to guaranteed security and acceptance as a great power. Instead, blind faith in nuclear deterrence has emboldened both sides to launch provocative military actions over disputed Kashmir: thus nuclear weapons have increased the risk of war between them.

Challenging the Nuclear Order: An important recent paper by British expert Dr Nick Ritchie, *A hegemonic nuclear order: Understanding the Ban Treaty and the power politics of nuclear weapons*, examines how the US-led nuclear order has evolved around nuclear deterrence.

The 2017 Treaty on the Prohibition of Nuclear Weapons (TPNW) represents a significant challenge to the P5's oligarchic power to establish

norms biased towards non- and counter-proliferation, co-opt dissenters and institutions, and sustain mainstream acceptance of nuclear deterrence dogma. This nuclear cartel recognises that reframing the discourse from an arms control and non-proliferation mind-set to a 'humanitarian disarmament' standpoint threatens their status quo.

Hence the ferocity of their response led by the western group, bitterly protesting at how irresponsibly naive the 122 member States who had adopted the TPNW had been in destabilising international security, when US-Russian relations

were deteriorating and North Korea had demonstrated further strides in its nuclear capability. This bluster tried to deflect attention from US President Trump's far more destabilising determination to renege on the Iran Joint Comprehensive Plan of Action, expand US ballistic missile defence, and even question the value to the US of NATO. The TPNW represents a new, determined diplomacy of

resistance, fuelled by frustration over the nuclear cartel modernising their arsenals. The nuclear order is constrained by US ability to maintain subservience through bargaining between the dominant and dominated, employing strategies of inhibition applied to friends and foes alike, including aid, conventional arms sales, alliances and extended nuclear deterrence.

The post-Cold War period witnessed a shift from non- to counter-proliferation, preventing the acquisition of nuclear weapons by threatening attack against regional 'rogue' states, including first use with new low-yield nuclear warheads. In so doing, nuclear deterrence doctrine had been effectively inverted from professed prevention of war to pre-emptive war backed by ballistic missile defence, thereby exposing its practical irrelevance, not least in countering terrorism after 9/11.

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Ritchie discusses how the western group have led development of benign conceptions of 'responsible' nuclear sovereignty and norms of behaviour, forming a respectable façade for what is essentially a fetishisation of nuclear weapons, imbuing them with extraordinary symbolic power. This subject was first tackled in 2009 by Anne Harrington de Santana in her subversive critique, *Nuclear Weapons as the Currency of Power: Deconstructing the Fetishism of Force*. In support, institutions have been established to monitor and control nuclear weapon and energy programmes, such as the IAEA, the 48-member Nuclear Suppliers Group, and the Zangger Committee with 39 member States. These institutions are not neutral, but politicised fora that fix systems of bias, privilege and inequality.

Other important US-dominated institutions include NATO and its Nuclear Planning Group, and the bilateral Asia-Pacific nuclear alliances. Then there is the institution of US-Russia nuclear arms limitation, developed to organise and constrain Cold War nuclear arms competition, manage the risk of nuclear violence in crises, and displace disarmament as the more logical, equitable and effective alternative path. Closely linked to bilateral attempts at arms control is the US-Russia consensus to persist with over 1,500 strategic nuclear warheads on each side at minutes' notice to launch before confirmation of a nuclear strike, almost thirty years after the Cold War ended. This demonstrated the pernicious influence of nuclear deterrence doctrine and the associated nuclear order.

Underpinning this entire construct has been a deliberate socialisation of ideas to mould a pro-nuclear consensus, and side-line or suppress other ways of thinking about security, justice, and nuclear order through indoctrination, self-censorship, and exclusion of those 'out of touch with the real world' who do not accept nuclearism.

This regime of acceptable knowledge, or 'institutional truth', has brought us to the current perversely unsustainable situation, especially with the US erosion of arms control agreements. Western nuclear weapons are seen as inherently

legitimate and good for international peace and security; but those in the hands of authoritarian states or those beyond the West's sphere of influence are illegitimate and undermine a western interpretation of international order.

The Nuclear Deterrence and Disarmament Crisis: However, in addition to all nuclear-armed states modernising their arsenals, in February last year, the new US Nuclear Posture Review signalled the start of the most serious nuclear deterrence and disarmament crisis for 30 years. In May 2018, Trump trashed the Iran Joint Comprehensive Plan of Action; then early this year the US released a Ballistic Missile Defence Review, and then withdrew from the Intermediate Nuclear Forces Treaty. The 2018 US Nuclear Posture Review revives enthusiasm for 'usable' low-yield nuclear warheads to shore up nuclear deterrence credibility. It includes a new, low-yield Trident nuclear warhead; a new nuclear-armed cruise missile; and a more accurate, guided version of the B61 freefall nuclear bomb with lower variable yield between 0.3-50 kilotons (the Hiroshima bomb was 16 kilotons), and a fusing system more capable of withstanding the shock of penetrating hardened and deeply buried targets. This will replace 150 older models B61 bombs deployed in Belgium, Netherlands, Germany, Italy and Turkey.

The US Missile Defence Review, published in January 2019, commits the US to expanding ground and space-based systems. These violate the fundamental principles of Mutual Assured Destruction – but there seems to be a lack of awareness, let alone alarm, about this in mainstream western commentaries. One new, particularly dangerous development is the push to deploy conventionally armed ballistic missiles in US submarines, possibly including Trident, for pre-emptive 'Prompt Global Strike' against a threat which otherwise would require a nuclear response. An obvious risk would be that, even if the conventional warhead is launched in a different ballistic missile from Trident, Russia would presume it was a nuclear strike.

A Global Nuclear Tinderbox: The announcement on 2 February of US withdrawal from the 1987 INF

Treaty, followed the next day by Russia's withdrawal, means that the world – especially Europe – is faced with a far more dangerous rerun of the 1979 NATO decision to deploy nuclear-armed Cruise missiles and Pershing ballistic missiles in Europe to counter Soviet SS-20 intermediate range ballistic missiles. This time the US leadership is unlikely to listen to European concerns, which are heightened by a more ambiguous US/NATO nuclear posture; probable collapse of US-Russian arms control initiatives, and even greater consequent public alarm and resistance. This could severely strain NATO cohesion, and trigger a major rethink of its nuclear deterrence doctrine.

The inevitable consequence of US hubristic abuse of its hegemonic nuclear order, and the Russian response, is to increase the risk of nuclear weapon use through miscalculation, mistake or malfunction. Moreover, there is general acceptance that once the first nuclear detonation occurs, escalation to all-out nuclear war would rapidly and uncontrollably follow.

In predictable response, specifically to Trump's withdrawal from the INF Treaty, President Putin claimed in his state of the nation address on 20 February that, in addition to new weapon systems soon to become operational, Russian submarines stationed off the east and west US coasts are now capable of launching Zircon hypersonic stealthy cruise missiles invulnerable to ballistic missile defence with a range of up to 1,000 km. The inevitable consequence of US hubristic abuse of its hegemonic nuclear order, and the Russian response, is to increase the risk of nuclear weapon use through miscalculation, mistake or malfunction. Moreover, there is general acceptance that once the first nuclear detonation occurs, escalation to all-out nuclear war would rapidly and uncontrollably follow. Facilitating all this has been a fallacious and disingenuous lumping together of nuclear with chemical and biological weapons of mass destruction by some policy-makers, when the reality is that nuclear

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Source: <https://www.opendemocracy.net>, 03 April 2019.

OPINION – Manoj Joshi

Decoding China's BMD and ASAT Systems Efforts

China began its efforts in the area of BMD and ASAT systems by taking a two track approach, one where it opposes them on the grounds that they will undermine nuclear stability. At the same time, China also developed a range of options that related to both capabilities. It must be noted, though, that ASAT and BMD capabilities are not identical. It is relatively easier to predict the trajectory of a satellite than a ballistic missile. Likewise, satellites offer a greater radar cross-section than a missile target. The Chinese began research in missile interception in 1964, but the programme was given a crucial boost with its inclusion in the prestigious Project 863 in the late 1980s. The 2001 US withdrawal from the ABM Treaty only served to encourage Beijing on the path of developing its own BMD/ASAT systems.

The Chinese BMD effort is a natural outcome of its pursuit of air defence systems against aircraft and cruise missiles. Over the years, China's radar and long-range SAM systems have given it a limited capability against the shorter-ranged ballistic missiles, just as they had done in the case of the United States. In recent decades, they have developed substantially. China has benefited from the Soviet and Russian technology and in recent years, the two countries have come closer to each other in anti-missile cooperation. In December 2017, for

example, they had a joint computer simulated ABM exercises.

BMD systems involve the ability to detect the incoming missile, track it and intercept it using your own weapon, be it missile or laser system. They can be intercepted as they take off in the boost phase, or when their rockets burn out and the re-entry vehicle is moving on a ballistic trajectory in space, and finally when they re-enter the atmosphere and head to their target in the terminal phase. Over the years, the Chinese have developed capabilities in all these areas. These, in turn, have given the Chinese the abilities in the ASAT domain. According to observers, as of today, the tests conducted by China and the equipment like radars and missiles that they have developed indicates that "these are not isolated technology demonstrations" but systems which are meant to be deployed operational systems.

Chinese Missile Systems: To start with, Chinese capabilities took a quantum leap in 1993 with the import of the S-300 system from Russia. The 48N6E2 missile of this system is optimised to destroy short-range ballistic missiles. In recent years, China acquired the S-400 with its ability to deal with missiles with ranges up to 3,500 km. In actual fact, their ability to deal with ballistic missiles is limited to short-range missiles. China's own HQ-9 long-range SAM, a derivative of the S-300, can handle ballistic missiles of 500 km range. This has been used to develop the HQ-19 (and its ASAT derivative the SC-19) missile, to kill interceptor. China has tested this missile several times and can deal with missiles of the range of 1,000-3000 km. The HQ-19/ SC-19 is all right for medium-range missiles and LEO satellites, but

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for interception at higher altitudes, the Chinese are developing the Dong Neng missiles aimed at mid-course interception. Multiple tests of the DN system have taken place since 2010.

Chinese Radars: Chinese work on of Large Phased Array Radars (LPAR) began in the 1970s. In recent years' evidence has emerged of very substantial Chinese advances in the LPAR field

which are crucial for any kind of BMD and ASAT capability. The US says that China's JL-1A and JY-27A radars are aimed at tackling the ballistic missile threats; with the former being able to precision track multiple

ballistic missiles. It is an anti-missile radar with 2D digital active phased array system, while the latter is a land-based long-range air surveillance and guidance meter-wave 3D radar. In October 2017, a report in a Chinese website revealed large P-band radar with a detection range of 5,000 km. The aim of the radar, which is based on the periphery of the country, reportedly Shandong peninsula, is to intercept and track strategic missiles launched

from the direction of Japan, South Korea and Guam.

The report also spoke of the setting up of an X band radar in Heilongjiang. The main task of this radar is to guide intercepts of targets detected by the P-band long-range radar. While the JL-1A is likely to

be the X-band radar, experts say that it is not clear what is the designation of the P-band radar that has been set up in Shandong province of China. The Chinese conduct their tests from their test site in Korla, Xinjiang. Since the hit-to-kill vehicles can be used for BMD and ASAT, the site probably services both functions. Missiles are launched from the nearby Shuangchengzi Space and Missile Centre (SSMC).

Chinese Tests: In January 2007, China launched a hit-to-kill vehicle from Xichang satellite launch centre in Sichuan, at a defunct Chinese weather satellite in orbit 800 km above the earth. The impact generated over 3,000 pieces of trackable objects and ten times that number of pieces that can't be tracked. These are a serious threat to other satellites and the International Space Station and created an international furore. Subsequent tests have been non-destructive and have used other modes such as tests by timing capabilities. That is, putting a missile at a location at the precise time signalling an intercept. Since the 2007 test, China has avoided an overt ASAT test, but the US assessment is that several of its BMD tests have, indeed, been for the former purpose. According to one analyst, these were more by way of "developing and understanding" missile technology rather than a user-test of a deployable system. The Chinese have been willing to acknowledge their successful BMD tests, but avoid any reference to ASAT ones. When it comes to Chinese systems and tests, there is always room for ambiguity. The first major uncertainty in relation to a test is as to whether it is a BMD test or an ASAT one. Then, there are issues relating to dual use space activity such as satellite inspection, refuelling or the use of robotic arms for satellite capture or repair.

India: Joseph Trevithick says that the SC 19 is more akin to the US THAAD, useful to take out missiles in their terminal phase. He notes that these tests could be related to Agni missiles that India has deployed the Agni II MRBM and the Agni III IRBM and is still testing the Agni IV and V. It is significant that China's 5 February 2018 BMD test took place several weeks after India's first pre-induction trial of its Agni V which is claimed to be an ICBM.

Of even greater significance, perhaps, was the revelation, just three days after the Indian test, that the Chinese had established a large anti-missile radar on the Qinghai plateau north-east of the Tibet Autonomous Region. The news was put out through the CCTV programme. It said that the anti-missile radar was an X band facility with the ability to track multiple targets. The Hong Kong news source that picked it up reported that it could pick up any target in South Asia at a range of 4,000 kms and pass it on to the SC-19 system for destruction.

Source: <https://www.orfonline.org>, 06 April 2019.

NUCLEAR STRATEGY

USA

2020 Trump Budget Aims to Boost U.S. Nuclear Capabilities

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Consistent with the recommendations of the 2018 Nuclear Posture Review (NPR), the Trump administration's fiscal year 2020 budget request would continue plans to expand U.S. nuclear weapon capabilities. The ultimate fate of the request, submitted to Congress March 11, 2019 remains uncertain as Democrats,

particularly in the House, have signalled strong opposition to several controversial funding proposals. Their concerns include administration plans to develop two additional low-yield nuclear weapons and two conventionally armed, ground-launched missiles currently prohibited by the 1987 INF Treaty. The budget submission illustrates the rising cost of the nuclear mission and the challenge those expenses may pose to the administration's other national security priorities.

A Congressional Budget Office report in February estimates that the United States will spend \$494 billion on nuclear weapons from fiscal years 2019 through 2028. That is an increase of \$94 billion, or 23 percent, from the CBO's previous 10-year

estimate of \$400 billion, which was published in January 2017.

The Trump administration's budget proposal contains increases for several Defense and Energy department nuclear weapons systems. The request does not change the planned development timelines for these programs. The largest increase sought is for the nuclear weapons account of the Energy Department's semiautonomous NNSA. The budget request calls for \$12.4 billion, an increase of \$1.3 billion above the fiscal year 2019 appropriation and \$530 million above the projection in the fiscal year 2019 budget request. The request includes funds for the continued development of two missile systems with ranges prohibited by the INF Treaty, but despite numerous queries by *Arms Control Today* and other outlets, the Pentagon has yet to divulge the amount.

Defense Department officials told a group of reporters March 13 that the Pentagon is planning to test a ground-launched cruise missile and a ballistic missile by the end of this year. The announcement came just over a month after the Trump administration announced on Feb. 2 that it would withdraw from the treaty on Aug. 2 unless Russia corrects alleged compliance violations with the agreement. The budget request for nuclear weapons programs is part of the overall \$750 billion request for national defense. That figure includes the Defense Department's regular budget activities and the Energy Department's nuclear weapons programs.

New Nuclear Capabilities: The budget request would finish development of a small number of low-yield nuclear warheads for SLBMs and begin

studies of a new fleet of SLCMs. The Trump administration's NPR report released in February 2018 called for developing two additional low-yield nuclear weapons primarily to counter

Russia's alleged willingness to use or threaten to use tactical nuclear weapons on a limited basis in a crisis or at lower levels of conflict, a strategy known as escalate to de-escalate.

Congress in 2018 approved nearly \$90 million for the two additional systems, but not without strong opposition from Democrats.

House Armed Services Committee Chairman Adam Smith (D-Wash.) has said he plans to oppose continued funding for the weapons. The NNSA is seeking \$10 million for the low-yield SLBM warhead, \$55 million less than the fiscal year 2019 appropriation. The request states that production of the warhead, known as the W76-2, will finish by the end of fiscal year 2019 and final program

documentation and close-out activities will be completed fiscal year 2020. The agency said in February that it had completed the first production unit for the warhead.

The Defense Department request includes funds to support production of the low-yield variant, although

the exact amount is not specified. The Pentagon is also seeking increased funding to "conduct an Analysis of Alternatives study in support of" developing a new SLCM, but the specific amount has not been announced. Such an analysis is one of the first steps the Pentagon takes in the usually lengthy process to acquire a new weapons system. The NNSA request includes as much as \$12 million to begin a study of the warhead for a new SLCM.

The Nuclear Triad: The budget request would keep on schedule the Defense Department's programs to sustain and rebuild the U.S. triad of nuclear-

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armed missiles, submarines, and bombers and their associated warheads and supporting infrastructure. The request includes \$2.2 billion for the Navy program to build 12 Columbia-class ballistic missile submarines. The Air Force is seeking \$3 billion to continue development of the B-21 Raider strategic bomber, \$713 million for the long-range standoff weapon program to replace the existing ALCM, and \$678 million for the program to replace the Minuteman III ICBM with a missile system called the Ground-Based Strategic Deterrent. The NNSA is asking for \$793 million to continue developing and begin production of the B61-12 gravity bomb life-extension program and \$899 million to refurbish

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The request for the ALCM warhead is \$244 million more than the current appropriation and \$185 million above last year's projection for fiscal year 2020. The request also includes \$112 million to continue the design of the W87-1 warhead to replace the W78 warhead currently carried by the Minuteman III ICBM and an increase of more than \$16 million above last year's appropriation to sustain the B83-1 gravity bomb. The NPR report recommended retaining the B83-1 gravity bomb, the only remaining megaton-class warhead in the U.S. stockpile, reversing the Obama administration's proposal that the warhead be retired once confidence in the B61-12 is achieved.

Nuclear deterrence means that when the U.S. has nuclear weapons, it tempers in some fashion the activities of potential adversaries around the globe — helping to ensure those adversaries don't make dangerous miscalculations about what they can get away with based on what they think the U.S. is capable of or willing to do in response.

Source: <https://www.indepthnews.net>, 03 April 2019.

4 Things to Know About the U.S. Nuclear Deterrence Strategy

U.S. military leaders went before lawmakers to emphasize a handful of critical, but immensely important points about America's nuclear weapons capabilities. Acting Defense Secretary Patrick M. Shanahan and Marine Corps Gen. Joe Dunford, the chairman of the Joint Chiefs of Staff, testified at a House Armed Services Committee hearing. David Trachtenberg, deputy undersecretary of defense for policy, spoke before the HASC strategic forces subcommittee. The fiscal year 2020 budget request from President Donald J. Trump was the impetus for both hearings, but America's nuclear

defense strategy was clearly important to lawmakers on both days.

Important Takeaways from this Glowing-hot Topic:

1. Nuclear deterrence is a top priority within the U.S. military. "It's our singular, most important mission," Dunford told lawmakers. "Nuclear deterrence is the bedrock of U.S. national security," Trachtenberg said. "Our nuclear deterrent underwrites all U.S. military operations and diplomacy across the globe. It is the backstop and foundation of our national defense. A strong nuclear deterrent also contributes to U.S. non-proliferation goals by limiting the incentive for allies to have their own nuclear weapons." Nuclear deterrence means that when the U.S. has nuclear weapons, it tempers in some fashion the activities of potential adversaries around the globe — helping to ensure those adversaries don't make dangerous

miscalculations about what they can get away with based on what they think the U.S. is capable of or willing to do in response.

2. Recapitalization, often referred to as modernization, of America's strategic nuclear capability is critical, defense officials have said. Recapitalization means that existing weapons will be replaced with completely new weapons or will be overhauled from the ground up and equipped with the latest technology.

Recapitalization of the nuclear force during the next 20 years will comprise, at its highest point, about 3.7% of the DOD budget, a defense official said. This year's request to recapitalize the nuclear enterprise comprises about 1.2% of the total DOD budget request.

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3. America's strategic capability includes nuclear weapons such as those in missile silos, on submarines, and on bomber aircraft. The U.S. refers to those weapons, in those three locations, as "the nuclear triad." Weapons within the triad include ground-based Minuteman III weapons, submarine-launched Trident II missiles, and an array of nuclear bombs designed to be delivered aircraft such as the B-2 Spirit or the B-52 Strat fortress. These weapons systems are getting old and must be modernized to ensure they continue to operate and that they retain their deterrent capability, defense officials have said. "Nuclear forces are the ultimate foundation of our nation's security," Trachtenberg said. "Our deterrent forces must be modernized to remain credible. Delay is not an option." Defense officials have said China and Russia are prioritizing high levels of defense spending to modernize their nuclear forces and the U.S. must

China and Russia are prioritizing high levels of defense spending to modernize their nuclear forces and the U.S. must invest in its systems to maintain parity. A Pentagon official noted that the Russian defense minister has said that 90% of the country's strategic nuclear forces will be armed with modern weaponry by 2020.

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4. The U.S. military further seeks to strengthen deterrence by addressing an imbalance in its nonstrategic, or low-yield, nuclear weapons without matching Russia system for system, a defense official said. The official added that these supplemental capabilities will help ensure Russia, China and others do not believe they can benefit from using low-yield nuclear weapons on the battlefield against the U.S. or its allies and partners. The defense official said these capabilities do not require nuclear testing, do not violate arms control treaties, and in the end will reduce the likelihood that Russia will use its large number of non-strategic nuclear weapons, thereby strengthening deterrence and helping prevent conflict in the first place.

The U.S. recently suspended its obligations under the INF Treaty and gave notice of its intent to withdraw after long-term violations of the treaty by Russia, a defense official said, adding that U.S. allies fully support the decision. "Russia is in

material breach of the INF Treaty and must use the next six months to return to full and verifiable compliance or bear sole responsibility for its demise," NATO Secretary General Jens Stoltenberg wrote on Twitter. The US is now examining options for its conventional ground-based intermediate strike missiles, a defense official said. The official noted that the initial developmental work is designed to be reversible should Russia resume complying with the INF Treaty before the six-month period expires.

Source: C. Todd Lopez, <https://www.defense.gov>, 01 April 2019.

Will Congress Let Trump Build More Nuclear Weapons?

President Donald Trump's plan to expand America's nuclear arsenal is encountering sharp opposition in the Democratic House of Representatives, with critics saying the administration is creating unnecessary risks to world peace—particularly by adding new tactical nuclear weapons that can be used in a conventional war. The debate is potentially set to come to a head in June, when the House will begin marking up the annual defense policy bill.

The clash comes at a pivotal moment for global arms control. The Trump administration is seriously considering dismantling at least one treaty with Russia that has set arms control policy for the past 30 years. Meanwhile, China, which is largely unbound by Cold War-era arms control agreements, is swiftly building up its military arsenal, including both nuclear and conventional missiles. And in the background, North Korea and Iran are both developing their own nuclear arsenals.

The question Congress and the administration must resolve is one that has been at the core of arms control debates for decades and has no easy answer: If potential adversaries begin to challenge U.S. dominance in nuclear weapons, is the world safer with an unmatched U.S. deterrent, or without it?

Former President Barack Obama initiated the current plan to modernize America's aging

arsenal of nuclear weapons: the Air Force's bombers, nuclear cruise missiles, and land-based intercontinental ballistic missiles, as well as the Navy's nuclear-armed submarines. In 2017, the Congressional Budget Office estimated that the Obama administration's plan to replace and maintain the arsenal over the next 30 years would cost \$1.2 trillion, including \$400 billion for modernization alone. Congress largely supported Obama's plan.

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But in 2016, then-President-elect Trump signaled a shift in strategy, tweeting that the United States "must greatly strengthen and expand its nuclear capability." Trump released a new Nuclear Posture Review in February 2018 that reaffirmed and expanded the Obama administration's modernization plan, calling for new warheads and missiles, including additional tactical nuclear weapons, in order to maintain an effective deterrent against Russia's and China's expanding arsenals.

Of that, \$17 billion over the next decade will go toward building two new tactical, low-yield nuclear weapons and increasing U.S. capacity to produce plutonium pits, the core of nuclear weapons. Tactical nuclear weapons are designed to be used on a conventional battlefield, rather than launched from afar, and are generally smaller in explosive power.

Trump's new plan is expected to cost almost \$500 billion over 10 years—an increase of about 23 percent from Obama's—according to the Congressional Budget Office's 2019 estimate. Of

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Implementing Trump's plan requires Congress to approve funding, both to continue modernizing the nuclear triad and to develop the new weapons.

Democrats have already signaled their opposition to the plan: This past fall, several lawmakers introduced legislation to ban the Pentagon from developing a new, low-yield nuclear warhead.

The Nuclear Posture Review argues that the development of two additional weapons will make nuclear war less likely, not more. The move “is not intended to enable, nor does it enable ‘nuclear war-fighting.’” Rather, it will “raise the nuclear threshold and help ensure that potential adversaries perceive no possible advantage in limited nuclear escalation, making nuclear weapons employment less likely.”

But Democratic Rep. Adam Smith, who chairs the House Armed Services Committee and is a key player in writing U.S. defense policy, has come out strongly against the Trump administration’s plan, particularly the new low-yield weapons. Smith even went so far as to say publicly that the ICBM leg of the nuclear triad, one that has traditionally enjoyed bipartisan congressional support, is not necessary to deter Russia and China. He has since softened that stance but stuck to his argument that the United States needs fewer, not more, nuclear weapons.

Source: Lara Seligman, <https://foreignpolicy.com>, 11 April 2019.

BALLISTIC MISSILE DEFENCE

CHINA

China’s Ballistic Missile Defence and Hypersonic Glide Vehicle Program

On March 27, India conducted its first successful ASAT missile test, storming into an elite club of 3 nations – the US, Russia and China, with a capability to disarm and disable enemy satellites. However, countries like China have had a head start in this technology propelled by a robust BMD program and heavy investment and development

into hypersonic propulsion programs that have worried countries with similar designs, particularly the US. Reports published by the US Defence Intelligence Agency (DIA), with “China_Military Power” being the latest one shed light on the secretive development of these projects greenlit by Beijing. The report asserted that the PLA has formed military units trained for space attacks. Other missiles may be tested for attacks in geosynchronous orbit at ranges of up to 23,000 miles. The DIA also warned, “The PLA unit responsible for conducting signals intelligence has supported cyberespionage against US and European satellite and aerospace industries since at least 2007.”

China is also developing a BMD system, in which satellites play a key role. The Pentagon assessed: “China is working to develop ballistic missile defences consisting of kinetic-energy exo-atmospheric and endo-atmospheric interceptors. In 2016, official media confirmed China’s intent to move ahead with land- and sea-based midcourse missile defence capabilities.” China has at its disposal the HQ-19 midcourse interceptor that

can target ballistic missiles possessing ranges of up to 3,000km. The US Department of Defense was of the opinion that “an HQ-19 unit may have begun preliminary operations in western China”. Lower in capability and better suited for point defence against tactical missiles is the HQ-9 SAM. Newly delivered S-400 SAMs from Russia will also permit the PLA to engage missiles, while ground-based radars such as the JY-27A and JL-1A can track incoming ballistic missiles.

China performed a successful BMD test using a DN-3/KO09 hit-to-kill midcourse interceptor on 5 February 2018, where it hit a DF-21 target. China has been testing the DN-3 since 2010, and it is analogous to the American SM-3 missile,

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although it has not yet hit an intermediate-range or intercontinental ballistic missile. As an exo-atmospheric midcourse kinetic interceptor, the DN-3 could also act as an ASAT platform. China has ballistic missiles possessing multiple independently targetable re-entry vehicle warheads as well as manoeuvrable re-entry vehicles. It also continues to develop hypersonic glide vehicles (HGV), essentially a warhead that separates from a ballistic missile and proceeds to travel at speeds beyond 7,000 miles per hour on the edge of space. These can perform both nuclear and conventional attacks, and their incredible speed and manoeuvrability ensure they render existing missile defences basically useless.

Beijing successfully tested its Xing Kong-2 HGV on 3 August 2018. It is one of two confirmed Chinese HGV programs, the other being the DF-ZF that has been tested at least seven times since the first on 9 January 2014. All are launched from the Taiyuan Satellite Launch Centre, with the 10th Research Institute of CASIC's 1st Academy in charge of this project. An HGV could be launched from existing Chinese missiles such as the DF-11, DF-15, DF-16, DF-21 or DF-26. However, the 1,500km-range DF-21 seems best suited for China to add HGVs, bringing all of East Asia within reach when the HGV's own 1,000km range is added to the missile's range. HGVs could be fitted with either conventional or nuclear weapons. Even the mere kinetic impact of a device hitting a target at Mach 5 would destroy hardened underground facilities. They could thus perform decapitation strikes against key command nodes. Only China, Russia and the USA are currently researching HGVs, as it is an extremely expensive endeavour. The USA is believed to be leading this field of research, as well as scramjet-powered hypersonic cruise missiles. The latter could take off from a runway and reach anywhere on the globe within 1-2 hours.

A report by The Jamestown Foundation think-tank assessed, "If China successfully designs an operational medium-range HGV, it will have a better chance of delivering successful missile strikes against its regional adversaries. Given

China's regional focus - particularly on developing the ability to defeat Taiwan militarily - a shorter-range HGV addresses China's more immediate needs." The same article speculated that the first DF-ZF missiles could be stationed in Base 61 of the PLA Rocket Force. It suggested that the brigades formerly numbered 807, 817 and 819 would be most likely tapped to field HGVs given their proximity to Taiwan. Nevertheless, such missiles carried on mobile launcher vehicles can be easily deployed around China. If China added scramjets, HGV missile units would have greater reach anywhere in the world. The country is known to be researching this complex technology.

It is unclear, however, when China might deploy HGVs. Professor Dennis Gorley from the University of Pittsburgh, testifying before a US-China Economic and Security Review Commission Hearing, stated, "The extent to which China has achieved anything beyond copycatting to demonstrate interest or intention remains to be seen. At the moment, neither the United States nor China appears close to deploying either HGVs or hypersonic cruise missiles." The Jamestown Foundation authors concluded: "Based on an analysis of China's HGV development, the authors speculate that the PRC's main priority for the DF-ZF is to bypass regional BMD." We may expect China to perform regular tests of the DF-ZF, simply to display its military power and remind neighbours of its prowess. ...

Source: <https://www.business-standard.com>, 07 April 2019.

GENERAL

The Future of Hypersonic Weapons: Defending Against Super-Fast Missiles

Hypersonic weapons are missiles that can travel at speeds of Mach 5 or higher, which makes them particularly difficult to defend against. What are the most advanced hypersonic weapons and how can we stop them? Capable of travelling at more than five to ten times faster than the speed of sound, hypersonic missiles are both an impressive technological innovation and a worrying prospect. With some of the world's largest militaries, such

as the US, Russia and China all developing hypersonic weaponry, the current methods of airborne warfare as we know them could be overhauled completely. What does the future of hypersonic weapons look like, and what defensive measures can we take against them?

Future of Hypersonic Weapons: Cruise Missiles vs Gliders: There are two types of hypersonic weapons currently in development: hypersonic cruise missiles (HCMs) and hypersonic glide vehicles (HGVs). The former employs a high-speed jet engine to travel at super-fast speeds of more than Mach 5 (6,174km/h) or one mile per second, while some concepts are reportedly capable of reaching Mach 10 (7,672km/h). HCMs are non-ballistic – meaning they do not follow a ballistic trajectory in the same way conventional ICBMs do. The cruise missile will continue to pick up speed from launch. The second type of hypersonic weapon is the HGV, which leaves the atmosphere on an arching trajectory and re-enters to locate a target. While it does act more like a ballistic missile, it is different to ICBMs in that the warheads are attached to an aerodynamic glide vehicle that re-enters the atmosphere using aerodynamic forces to gain enough speed to overcome existing missile defence systems.

The US's Arrow and Hacksaw: The US Air Force selected Lockheed Martin for the development of two new hypersonic weapons – nicknamed the 'Arrow' and the 'Hacksaw'. The AGM-183A Advanced Rapid Response Weapon (ARRW) is an air-launched platform, which Lockheed Martin claims will be four times faster than weapons currently in development in Russia and China. It will launch from a large aircraft such as the B-52 bomber, and use rocket engines to propel it out of the Earth's atmosphere before returning at an unpowered glide to hit its target, at speeds of up to Mach 20 (24,696km/h). Meanwhile, the Hypersonic Conventional Strike Weapon (HCSW) will use solid-propellant rocket boosters to propel

it to speeds of greater than Mach 5 on a more horizontal trajectory. It will use GPS guidance to reach its target, giving it the advantage over missile defence platforms, which would have to eliminate the high-speed threat much more quickly than a conventional cruise missile.

Russia's Kh-47M2 Kinzhal: The Kh-47M2 Kinzhal, developed by the Russian Defence Ministry for use by the Russian Aerospace Forces, is an air-launched ballistic missile that is also nuclear-capable. Russia claims the missile can travel at speeds of Mach 10 over a range of around 2,000km, and even up to Mach 12 (14,818km/h) over shorter distances. It can be air-launched from aircraft such as the Tu-22M3 bomber or the MiG-31K interceptor, and has already been deployed at air force bases in Russia's southern military district. Russia is also developing the new 3K22 Tsirkon HCM, which can travel up to Mach 6 within a range of 483km to 998km, as well as a new ICBM HGV – the Avangard – which could enter service this year.

China's Starry Sky-2 HGV: The Chinese military successfully tested its Starry Sky-2 HGV, which reportedly can evade any existing missile defence system, in August 2018. Travelling at a top speed of Mach 6 (7,409km/h), the Starry Sky-2 can carry both conventional and nuclear warheads. Military expert and television commentator Song Zhongping told the Global Times: "Announcing the successful test to the public indicates that China must have already made a technological breakthrough with the weapon. "The test showed that China is advancing shoulder to shoulder with the US and Russia."

The UK and France's CVS401 Perseus: For the last eight years, the Royal Navy and the French Navy have been developing a hypersonic missile concept – the CV401 Perseus – to replace the aging anti-ship missiles Harpoon and Exocet that can travel at much lower speeds of Mach 0.71 (864km/h) and Mach 0.92 (1,134km/h)

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respectively. The Perseus, a supersonic and hypersonic cruise missile, can travel at Mach 5, making use of its agile airframe and ramjet motor built around a continuous detonation wave engine, which according to a NATO report, is expected to outperform conventional propulsion engines. The concept is expected to come into service in 2030.

Difficulties in Defending against Hypersonic Weapons: Hypersonic weapons are, objectively speaking; a great feat of mechanical engineering and some countries have made impressive progress in developing future hypersonic weapon attack capabilities. Less work, however, has gone into solving the problem of how to defend against enemy HCMs and HGVs. Enter the US's Defense Advanced Research Project Agency (DARPA), which is currently developing its 'Glide Breaker', touted as the hypersonic weapon killer. According to the US Government Federal Business Opportunities website, the "Glide Breaker will develop an enabling technology critical for an advanced interceptor capable of defeating hypersonic vehicles." While the Glide Breaker is expected for testing in 2020, very little information has been released on how it will work. However, its development, and subsequent activity by the US's rivals, could shift the current arms race from hypersonic weapons-attack to hypersonic weapons-defence.

Source: <https://www.airforce-technology.com>, 09 April 2019.

NUCLEAR ENERGY

CANADA

First Canadian SMR Licence Application Submitted

The Canadian Nuclear Safety Commission (CNSC) has received the first licence application for a small modular reactor. The application from Global First Power (GFP), with support from Ontario Power Generation and Ultra Safe Nuclear Corporation (USNC), supports a proposal to deploy a Micro Modular Reactor plant at Chalk River in Ontario.

The companies on 02 April, 2019, announced their submission of the application, which is in response to an invitation issued in April 2018 by Canadian

Nuclear Laboratories (CNL) to SMR project proponents for the construction and operation of an SMR demonstration unit at a CNL-managed site. GFP's proposal in February became the first to advance to the third stage of CNL's four-step review process, meaning the partners have been invited by CNL to take part in preliminary, non-exclusive discussions regarding land arrangements, project risk management, and contractual terms.

The MMR is a 15 MW (thermal), 5 MW (electrical) high-temperature gas reactor, drawing on operational experience from reactors developed by the USA, Germany, China and Japan. According to WNA information, the reactor uses fuel in prismatic graphite blocks and has a sealed transportable core. The reactor completed the first phase of the CNSC's pre-licensing vendor design review process in January. MMR technology would serve as a model for future off-grid SMR deployment in Canada, to provide low-carbon energy and heat to remote industry and northern communities, the partners said. This is one of the potential SMR applications highlighted in Canada's 2018 SMR Roadmap, which provides the framework for future SMR deployment in Canada. ...The application for a licence to prepare a site for an SMR at Chalk River was submitted on 20 March, CNSC said. The regulator's licensing process begins with a "sufficiency review" of the application. If and when the project description is assessed as complete, the next step for the regulator would be to issue a notice of commencement. The project description would then become available for public comment as part of the environmental assessment process.

Source: <http://www.world-nuclear-news.org>, 02 April 2019.

CHINA

China Targets Nuclear Fusion Power Generation by 2040

China aims to complete and start generating power from an experimental nuclear fusion reactor by around 2040, a senior scientist involved in the project said, as it works to develop

and commercialize a game-changing source of clean energy. China is preparing to restart its stalled domestic nuclear reactor program after a three-year moratorium on new approvals, but at a state laboratory in the city of Hefei, in China's Anhui province, scientists are looking beyond crude atom-splitting in order to pursue nuclear fusion, where power is generated by combining nuclei together, an endeavor likened by skeptics to "putting the sun in a box".

While nuclear fusion could revolutionize energy production, with pilot projects targeting energy output at 10 times the input, no fusion project has up to now created a net energy increase. Critics say commercially viable fusion always remains fifty years in the future. China has already spent around 6 billion yuan (\$893 million) on a large doughnut-shaped installation known as a tokamak, which uses extremely high temperatures to boil hydrogen isotopes into a plasma, fusing them together and releasing energy. If that energy can be utilized, it will require only tiny amounts of fuel and create virtually no radioactive waste.

Song Yuntao, deputy director of the Institute of Plasma Physics at the Hefei Institute of Physical Science, said that while technological challenges remain immense, the project has been awarded another 6 billion yuan in funding, and new construction plans are underway. "Five years from now, we will start to build our fusion reactor, which will need another 10 years of construction. After that is built we will construct the power generator and start generating power by around 2040," he said at the site, built on a leafy peninsula jutting into a lake.

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China is responsible for manufacturing 9 percent of ITER's components, and is playing a major role in core technologies like magnetic containment, as well as the production of components that can withstand temperatures of over 100 million degrees Celsius (180 million degrees Fahrenheit).

China has been researching fusion since 1958, but at the current stage, it is still more about international cooperation than competition, Song said. The country is a member of the 35-nation ITER project, a 10-billion euro (\$11.29 billion) fusion project under construction in France. China is responsible for manufacturing 9 percent of ITER's components, and is playing a major role in core technologies like magnetic containment, as well as the production of components that can withstand temperatures of over 100 million degrees Celsius (180 million degrees Fahrenheit).

ITER is scheduled to generate first plasma by 2025. A demonstration reactor will then be built, with the aim of creating 500 megawatts of power from just 50 megawatts of input, a tenfold return on energy. Despite the critics who say dependable fusion energy is unrealistic, Song said he was confident breakthroughs are being made. "Because we have a lot of technology now, a lot of challenges in plasma physics have been overcome, and I think this will speed up the entire process," he said.

Source: David Stanway, <https://in.reuters.com>, 12 April 2019.

China to Fall Short of 2020 Nuclear Capacity Target

China will fall short of its nuclear power generation capacity target for 2020, according to a forecast from the China Electricity Council on 02 April, 2019. Total nuclear capacity is expected to reach 53 GW in 2020, below a target of 58 GW, council vice chairman Wei Shaofeng told the China Nuclear Energy Sustainable Development Forum in Beijing. China is the world's third-biggest nuclear power producer by capacity, with 45.9 GW

installed by end-2018 and 11 units still under construction, but its reactor building program has stalled since the 2011 Fukushima nuclear disaster in Japan. No new approvals have been granted for the past three years, amid spiralling costs, delays for key projects and safety concerns about new technologies. Environmental impact assessments for two new projects in southeast China were submitted to regulators last month, however, paving the way for a resumption of its atomic energy program. Wei said capacity should reach 137 GW by 2030 if China raised the pace of nuclear construction to six to eight reactors a year from 2021 to 2030, and could hit 200 GW by 2035.

China's electricity consumption is expected to keep rising until at least 2035, allowing room for nuclear power to serve as an effective replacement for coal-fired power plants, he added. Overly rapid expansion, however, could end up lumbering the sector with overcapacity, warned Xu Yuming, vice chairman of the China Atomic Energy Association. "We need to plan scientifically in order to ensure the sector develops in a healthy way.... The costs of constructing new nuclear power plants is rising and our nuclear enterprises are facing more economic pressures," Xu told the conference. China's power pricing policies have left many nuclear reactors operating at less than full capacity in recent years, with tariffs for electricity from nuclear power plants more expensive than coal-fired power. Nuclear power has been cheaper than wind power, but a rapid fall in construction costs for wind and solar facilities over the past two years has improved their competitiveness. China is also backing new advanced reactor technologies, but costs for third generation nuclear reactors, are expected to be considerably more expensive than the earlier generation of reactors, according to a recent study by China Nuclear Energy Association.

Source: <https://www.reuters.com>, 02 April 2019.

China-Built Nuclear Reactors may Enjoy Home Advantage as Delays and Costs Stymie Foreign Competitors

China's home-grown nuclear technology is gaining favour in the battle for the nation's next generation of reactors, according to a state-owned developer, as it sought to recover from delays and cost blowouts from imported designs. China's reactor, known as the Hualong One, will be faster and easier to repair and maintain than competing foreign designs because it will be made at home,

according to Chen Hua, chief executive officer of China National Nuclear Power Company (CNNP), which builds and operates nuclear power projects. ...

The global nuclear industry has been awaiting a revival in China after cost overruns and stricter regulation after the 2011 Fukushima disaster in Japan stalled the approval and construction

of more units. The country's expanding energy demand and drive for cleaner energy have attracted Western reactor builders, including Westinghouse Electric from the US and *Electricite de France*. Their signature third-generation reactors – the AP1000 and EPR respectively – recently began commercial operations in China.

However, they face competition domestically, as state-run China National Nuclear Corporation, the parent of CNNP, and China General Nuclear Power Corporation (CGN) promotes the production and export of the Hualong One. CNNP operates the Sanmen project in eastern Zhejiang province, which uses Westinghouse's AP1000 design. After starting commercial operations at the No 2 reactor in November, it has been suspended after a problem with its coolant system at the end of last year. Westinghouse is examining the defect at Sanmen No 2 and will be responsible for the cost of fixing it as the unit is still under warranty, Chen said, adding that repairs may take as long as eight months. ...

China's power pricing policies have left many nuclear reactors operating at less than full capacity in recent years, with tariffs for electricity from nuclear power plants more expensive than coal-fired power. Nuclear power has been cheaper than wind power, but a rapid fall in construction costs for wind and solar facilities over the past two years has improved their competitiveness.

Curtiss-Wright, the US Company that made the pump, is working with Westinghouse to determine the cause of the problem. Its liability, "if any, is limited to the cost of repairing a part," up to the cost of replacing the entire pump, it said.... There are 12 more pumps in operation at three other AP1000 reactors in China. The race to build more reactors in China may intensify as a three-year freeze on approvals ended this year, clearing the way for the construction of four Hualong One units. The decision was regarded as an indication of China's preference going forward, Bloomberg NEF analyst Hanyang Wei said. China is expected to build more than 30 Hualong One nuclear reactors based on project approvals and development plans, Hualong International Nuclear Power Technology deputy general manager Xian Chunyu said at the Beijing conference on 02 April, 2019, without specifying a time frame. China may approve as many as 10 nuclear units in 2019, none of which will be AP1000s, according to the China Nuclear Energy Association. "The AP1000 is dead in China, and it may very well be dead all over the world," Chris Gadomski, lead nuclear analyst for Bloomberg NEF, said. "I don't know who would place an order for a new AP1000." Chen said the third-generation designs are similar in costs, but ultimately the choice will come down to which technology has a better support system and result in costs falling the fastest.

That is not to say the AP1000 is completely out of the race, according to Chen, who said the company may still use it. He called the technology an "advanced idea" and forecast it may take another eight years for it to reach commercial scale. China is also developing an upgraded version, called the CAP1400. "It's like a really good car, super advanced, but what happens if you do not have enough spare parts," Chen said. "So you might prefer something more mature. If there are

any issues, you're able to fix it." EDF said it was in discussion with China about the potential for more EPR reactors in the country. The French nuclear operator partnered with CGN to build Taishan Nos 1 and 2 in Guangdong province, and sees "room" for EPR development in China and at Taishan. "Sites for nuclear are getting scarce so it's good to consider high capacity power plants," Fabrice Fourcade, chairman of EDF China, said. "At the moment the only one available before CAP1400 comes into operation is EPR."

Source: <https://www.scmp.com>, 02 April 2019.

Nuclear Energy is a Key part of China's Belt and Road Policy

China wants to promote nuclear energy cooperation in the 'Belt and Road', and is focusing on new technology deployment and completing its radioactive waste management strategy, a conference in Beijing heard. The Belt and Road Initiative is a development strategy adopted by the Chinese government involving infrastructure development and investments in 152 countries and international organisations.

China wants to promote nuclear energy cooperation in the 'Belt and Road', and is focusing on new technology deployment and completing its radioactive waste management strategy, a conference in Beijing heard. The Belt and Road Initiative is a development strategy adopted by the Chinese government involving infrastructure development and investments in 152 countries and international organisations.

Opening the 2019 Spring International Summit at China's Nuclear Energy Sustainability Forum on 1 April, the chairman of China National Nuclear Corporation (CNNC), Yu Jianfeng, said human society is entering a new era of clean energy development. In the last three years, he said, China has shown the fastest growth rate of clean energy, including hydro, wind, solar and nuclear power. The country accounts for about one-fifth of nuclear capacity under construction globally – 10.8 GWe of the 56.3 GWe total – while its construction performance means eight of the last 10 new reactors to start up were in China. However, these start-ups are the result of construction approvals granted five or six years ago whereas approvals for new projects have been withheld for the last three years. This hiatus is

expected to end soon now that the first EPR and AP1000 units are in operation at Taishan and Yangjiang, respectively. In parallel, construction of the first indigenous Hualong One units, Fuqing 5 and 6, is progressing with installation of large components, such as the steam turbine, at an advanced stage.

The conference aimed to promote international cooperation on nuclear energy in the 'Belt and Road' and accordingly Yu highlighted the Chinese export to Pakistan of two ACP-1000 pressurised water reactors to the Karachi nuclear power plant. The first of these, Karachi 2, began construction in August 2015 and is nearing completion. It will be put into operation soon, he said. Pakistan started up new Chinese-supplied CNP-300 units in 2016 and 2017, doubling its nuclear power production to 6.2% of generation. When in operation the new Karachi units would take that to at least 16%. In China, Yu looked forward to the start-up of the high temperature gas-cooled reactor at Shidao Bay (Shandong Shidaowan).

The pilot pebble-bed design unit started construction at the end of 2012 and is now in the "final stage of installation and commissioning" to be completed in the first half of 2020, said Yu.

Waste Strategy Taking Shape: With its nuclear sector well established and growing fast, China is making firm plans to establish appropriate waste management infrastructure for the trend to continue. "In 2016, China set up a mechanism for the reprocessing of spent fuel at the national level, and the post-treatment of spent fuel was fully accelerated," Zhang Jianhua, deputy director of the China Atomic Energy Authority (CAEA), told the conference.

"At present, the construction of spent fuel reprocessing capacity in China is progressing steadily in accordance with the three-step plan of 'pilot scale, demonstration scale, and industrial scale'". A demonstration used fuel treatment plant, with a capacity of 200 tonnes of used fuel per year, is being built in Gansu Nuclear

Technology Industrial Park in Gansu province by CNNC Longrui Technology Company, which was set up in March 2015. 'Industrial scale' refers to a full-size reprocessing plant that would accept highly radioactive used nuclear fuel assemblies currently stored under water at power plants, before dissolving them to separate recyclable uranium and plutonium from waste products which can then be packaged ready for disposal. A coastal site in Jiangsu province has been suggested, so that used fuel could be transported by ship. In July 2016 Lianyungang city in Jiangsu was mentioned as likely for the site, close to the Tianwan nuclear power plant, but public protests caused local government to back away from the proposal.

At present, the construction of spent fuel reprocessing capacity in China is progressing steadily in accordance with the three-step plan of 'pilot scale, demonstration scale, and industrial scale'". A demonstration used fuel treatment plant, with a capacity of 200 tonnes of used fuel per year, is being built in Gansu Nuclear Technology Industrial Park in Gansu province.

Talks about this under cooperation with France made progress recently during Chinese President Xi Jinping's meetings in Paris with French President Emmanuel Macron. Regarding the disposal of nuclear wastes, Zhang said China had completed the site-selection work and the CAEA had approved plans for the first underground

laboratory for disposal of highly radioactive wastes. China has a "three-step strategy of 'site selection, underground experiment and disposal bank construction'", with the goal of finally building a high-discharge waste disposal site by 2050, he said.

Source: <http://www.world-nuclear-news.org>, 03 April 2019.

SAUDI ARABIA

Saudi plans to Invite Bids for Nuclear Power Project in 2020

Saudi Arabia plans to issue a multi-billion-dollar tender in 2020 to construct its first two nuclear power reactors and is discussing the project with U.S. and other potential suppliers, three sources familiar with the plans said. The world's top oil exporter wants to diversify its energy mix, adding nuclear power so it can free up more crude for export. But the plans are facing Washington's scrutiny because of potential

military uses for the technology.

Saudi Arabia, which aims to mine for uranium, says its plans are peaceful. But Crown Prince Mohammed bin Salman said in 2018 the kingdom would develop nuclear arms if Iran did.

U.S., Russian, South Korean, Chinese and French firms are in talks with Riyadh to supply reactors, a promising deal for an industry recovering from the 2011 Fukushima nuclear disaster. "Saudi Arabia is continuing to make very deliberate steps forward although at a slower pace than originally expected."... Saudi officials

previously said they aimed to select a vendor in late 2018, which then slipped to 2019. The sources said the tender would now be issued in 2020. Two sources said the project was proceeding slowly partly because the kingdom was still in discussions with all potential suppliers rather than narrowing them down to a short list. The plans have also been delayed by strained ties with Washington, which criticised Riyadh after the murder of Saudi journalist Jamal Khashoggi in the kingdom's Istanbul consulate in October, a source familiar with the talks said. Riyadh needs to sign an accord on the peaceful use of nuclear technology with Washington to secure the transfer of U.S. nuclear equipment and expertise, under the U.S. Atomic Energy Act. U.S. Energy Secretary Rick Perry said that the negotiations which began in 2012 were continuing.

The source said Washington has also been seeking to convince Riyadh to sign the IAEA's Additional Protocol on extra safeguards for verifying nuclear technology is used for peaceful applications. The kingdom has so far resisted, the source added. The fate of these negotiations could determine whether Riyadh reaches a deal with U.S. firms, the source said.

Workshops: Saudi Arabia, which sent a "request for information" (RFI) to nuclear vendors in 2017, is holding workshops with vendors from five nations as part of the pre-tender process, one

source said, adding that this was expected to last 12 to 15 months. The King Abdullah City for Atomic and Renewable Energy (KACARE), tasked with developing the nuclear programme, has brought in an executive from oil giant Saudi Aramco to help manage the pre-tender consultancy process, two sources said. The Energy Ministry, overseeing the project, and the kingdom's international press office did not respond to Reuters requests for comment. KACARE has in the past said the kingdom was considering building 17.6 gigawatts of nuclear capacity by 2032, requiring about 16

reactors. But the sources said the focus for now was on the first two reactors and a potentially smaller programme.

Neighbouring United Arab Emirates is building a nuclear power plant, the first in a Gulf Arab state. Iran, across the Gulf, has a nuclear plant in operation and has been locked in a row over its nuclear ambitions with the US.

Saudi Arabia, which has long vied with Iran for regional influence, has said it will not sign any deal with the US that deprives the kingdom of the possibility of enriching uranium or reprocessing spent fuel in the future, both potential paths to a bomb. South Korea's state-owned KEPCO, Russian state nuclear group Rosatom, French utility EDF, state-run China National Nuclear Corp and U.S. Westinghouse have expressed interest in the Saudi project.

Source: <https://energy.economictimes.indiatimes.com>, 05 April 2019.

USA

A Majority of Americans Oppose Nuclear Power. How does Nuclear 'Dread' Affect their Perceptions?

A new study finds that the public is more supportive of nuclear power when looking only at numbers about calculated risk—without knowing it's nuclear power they're dealing with. Nuclear power remains a controversial energy source in the US. It has continually encountered a range

Nuclear power remains a controversial energy source in the US. It has continually encountered a range of challenges, including safety concerns and cost effectiveness. And in 2016, for the first time, a majority of U.S. citizens opposed nuclear energy. But increased investment in new energy technologies will be a necessity if the U.S. is going to overhaul and decarbonize its energy system, which has historically relied on fossil fuels.

of challenges, including safety concerns and cost effectiveness. And in 2016, for the first time, a majority of U.S. citizens opposed nuclear energy. But increased investment in new energy technologies will be a necessity if the U.S. is going to overhaul and decarbonize its energy system, which has historically relied on fossil fuels. Despite widespread public aversion, nuclear energy could potentially be a viable avenue for decreasing carbon dioxide emissions.

A research team led by Ahmed Abdulla of the University of California–San Diego’s Centre for Energy Research and Deep Decarbonisation Initiative seeks to quantify “how much more nuclear power the public might be willing to accept if the dread associated with nuclear power were reduced or eliminated.” The team’s new study, which is currently available online and will appear in the journal *Energy Policy* in June, finds that respondents increase their support of the deployment of nuclear power when comparing the risks of different energies without knowing which energy belongs to which risk assessment.

The authors contend this suggests a disparity “between the technology’s actuarial risks and the dread it evokes.” According to Abdulla, actuarial risk is “the number of deaths (both from a potentially catastrophic event and overall) that have statistically resulted from” the deployment of the energy source. The numbers the study used to assess such risk are empirically supported by other research. Survey respondents were tasked with building an electricity portfolio for the U.S. in the year 2050 that included wind, solar, nuclear, traditional coal, coal with carbon capture and storage, and natural gas. Respondents had to both meet 100 percent of U.S. electric demand and cut power sector emissions by 50 percent (a cut that is consistent with broadly discussed decarbonisation goals). The researchers conducted two versions of the survey: One group was exposed to both the names of the technologies and their respective actuarial risk, and the other group was only exposed to the actuarial risk. When survey respondents saw only the actuarial risk of nuclear energy without the name (or the “label” as it is referred to in the study), they were far more likely to deploy it as part of their electricity portfolio.

To put their research in context, the authors cite additional studies that argue public fear about nuclear energy is largely rooted in individuals’ perception of the risks of nuclear power as “involuntary, immediate, unknown, uncontrollable, and possibly catastrophic.” Certain factors, among them gender, STEM (science, technology, engineering, and mathematics) education levels, political affiliations, and public discourse about energy and climate change can impact individuals’ perceptions of nuclear power’s risks. The authors cite two differing strands of academic thought that put forth explanations for why the risks of nuclear power remain inflated in the public imagination. One explanation is that societal attitudes about nuclear power are deeply rooted, and therefore virtually unchangeable (irrespective of the actual risk). The second view suggests public perception about nuclear energy is malleable, with the potential to be shaped by providing more information about the benefits of nuclear power. This study, Abdulla says, should make different players in the energy industry—among them academics, industry workers, and policymakers—“think much more deeply about this risk perception issue, which challenges nuclear and could challenge other technologies too.”

So what does this mean for the future of energy in the U.S.? The study found that, when respondents weren’t given the energy source label, they were supportive of a U.S. nuclear energy fleet about 40 percent larger than the current one (translating to 40 additional large power plants), which means it would generate more than 25 percent of the U.S. energy supply. The study could also prove useful for policymakers and advocates of nuclear power who are looking to decrease dread and communicate more effectively with the public, and could also apply to other technologies where there are disparities between actual and perceived risks. ...

Source: <https://psmag.com>, 05 April 2019.

NUCLEAR COOPERATION

ARGENTINA–CHINA

Argentina, China Still Discussing Nuclear Power Project

Argentina is still negotiating the terms of a Beijing-bankrolled nuclear power project in Buenos Aires

province, a government official said on 02 April, 2019, adding that China's own Hualong One reactor design would be a good choice for the scheme. The two sides are still deciding on the "new financial structures" of the project, known as Atucha III, Julian Gadano, undersecretary for nuclear energy for Argentina, told the China Nuclear Energy Sustainable Development Forum in Beijing. The deal is worth a reported \$8 billion.

A delegation from China was due to visit Argentina last month to discuss construction of the plant which, if finalised, would be one of the biggest projects financed in the South American country by Beijing. Construction of a Hualong One reactor in Argentina "will enable China to get involved in a mature market" and allow

it to show the world its technological advances in the sector, Gadano added. Hualong One is China's home-grown third-generation nuclear reactor design. One such reactor is under construction for use at the Karachi nuclear power complex in Pakistan, while China is also going through a long approval process to build one in Britain. Sources previously told...that the protracted negotiations over the Argentina project were partly due to due concerns over what proportion of components would be sourced from domestic suppliers. Li Xiaoming, assistant general manager of China National Nuclear Corp, said that the localization rate for the Argentinian reactor would be 40 percent, without elaborating.

Source: <https://uk.reuters.com>, 02 April 2019.

INDIA-USA

India's Nuke Deal with US Gets a New Life as Washington Reiterates Intent to Build Six Reactors as Planned

The slow-moving US plans to set up six nuclear power plants in India have received a boost as the two nations reiterated their commitment to strengthen security and civil nuclear cooperation during the 9th India-US Strategic Security Dialogue. A joint statement issued on 27 March, 2019, after the dialogue, where the Indian side was headed by Foreign Secretary Vijay K. Gokhale,

said that Washington "reaffirmed its strong support of India's early membership in the Nuclear Suppliers Group". "They committed to strengthen bilateral security and civil nuclear cooperation, including the establishment of six US nuclear power plants in India," it added. The statement also said that both countries declared their "commitment to work together to prevent the proliferation of weapons of mass destruction and their delivery systems and to deny access to such weapons by terrorists and non-state actors".

The US delegation to the dialogue held in Washington was led by Andrea Thompson, Under Secretary of State for Arms Control and International Security. The statement seeks to breathe new life into expected results of the civil nuclear cooperation

agreement between the two countries, which have failed to live up to the hopes since it was signed in 2008 during the Prime Ministership of Manmohan Singh and the Presidency of George W. Bush. The law limiting civil liability for nuclear damages from the plants passed in 2010 was meant to overcome a stumbling block for US companies to set up nuclear power plants in India. However, financial problems of the US company Westinghouse that had agreed in 2016 to build six plants in Andhra Pradesh put the plans on hold when it went into bankruptcy the next year. Now owned by Brookfield Asset Management, the US-based Westinghouse has received the backing of the Trump administration for the project and US Energy Secretary Rick Perry promoted it during a visit to India last year.

India has ambitious plans to increase its nuclear electric generation capacity to meet its growing needs with clean energy. Russia is the leading player in the nuclear power sector in India. Ahead of the dialogue, the third round of the US-India Space Dialogue was held on at which the two countries "discussed trends in space threats, respective national space priorities, and opportunities for cooperation bilaterally and in multilateral fora", the statement said. Indra Mani Pandey, India's Additional Secretary for Disarmament and International Security Affairs, and Yleem Poblete, the US Assistant Secretary of

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State for Arms Control, co-chaired the meeting.

Also on 26 March, 2019, Gokhale and David Hale, the Under Secretary of State for Political Affairs held India-US Foreign Office Consultations. A statement issued after the meeting by the State Department said that they affirmed “the importance of joint leadership to strengthen the rules-based order in the Indo-Pacific region”. “Recognising that the US and India share complementary visions for the Indo-Pacific, they agreed to deepen cooperation toward their joint goals in the region, including in conjunction with other Indo-Pacific partners,” it added.

The discussion between the two diplomats also covered the situations in areas of importance to the US — North Korea, where last month’s summit between US President Donald Trump and North Korean leader Kim Jong-un on denuclearisation failed; Iran, where Trump has pulled out of the multinational denuclearisation agreement and imposed sanctions on Tehran, and Venezuela, where the US has recognised opposition leader Juan Guaido as its president and wants Nicolas Maduro to step down following elections marred by irregularities. Trump wants India to play a major role in the Indo-Pacific region where the two countries act as bookends of democracy, a task Prime Minister Narendra Modi has cautiously embraced without making it appear a direct challenge to China. India and the US have also stepped up multilateral cooperation with the other two major democracies in the region, Australia and Japan.

Source: <https://techstockstandard.com>, 31 March 2019.

USA–SAUDI ARABIA

American Firms Approved to Work on Six Saudi Arabia Nuclear Projects

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Trump administration has reportedly green-lit eight applications to provide ‘initial nuclear work’ for projects in Saudi and Jordan. American companies have reportedly been given permission to work on six nuclear energy projects in Saudi Arabia and two in Jordan, according to a member of President Donald Trump’s cabinet.

Reuters reported that Energy Secretary Rick Perry confirmed during a Senate hearing that the Trump administration had approved six applications to deliver “initial nuclear work” in Saudi Arabia, and an additional two requests to work in Jordan. The American Energy Department approved 37 of the 65 applications it had received since 2017. Quoting Perry, the *Reuters* report – cited by *Construction Week’s* sister title *Arabian Business* – added: “What I’m really concerned about [...] is that if the United States is not the partner with Saudi Arabia, (or) for that matter Jordan, [then the countries] will go to Russia and China for their civil nuclear technology. “We’ve got a history of non-proliferation, and nobody in the world will do it better than us.” According to *Reuters*, the approvals were first reported by *The Daily Beast*, prior to which they had not been revealed. Perry had said that the companies involved in the approvals process wanted to secure proprietary information.

Saudi Arabia is backing clean energy sources, such as nuclear power, amid efforts to grow its economic revenue streams as part of its Vision 2030 mandate. Crown Prince HRH Mohammed bin Salman unveiled plans in November 2018 to build

Saudi Arabia's first nuclear research reactor, one of several project announcements during his visit to the King Abdulaziz City for Science and Technology at the time. The Crown Prince laid the foundation stone for the nuclear research project, according to Saudi Arabia's state news agency, SPA.

Source: <https://www.constructionweekonline.com>, 31 March. 2019

U.S. Senators Seek Details on Nuclear Power Cooperation with Saudi Arabia

U.S. senators from both parties on 02 April, 2019, asked Energy Secretary Rick Perry for details about recent approvals for companies to share nuclear energy information with Saudi Arabia, with the lawmakers expressing concern about possible development of atomic weapons. Saudi Arabia has engaged in "many deeply troubling actions and statements that have provoked alarm in Congress," Senators Bob Menendez, a Democrat, and Marco Rubio, a Republican, told Perry in a letter, a copy of which was seen by Reuters. The senators said Congress was beginning to re-evaluate the U.S.-Saudi relationship, and they believe Washington should not be providing nuclear technology or information to Saudi Arabia now.

The Trump administration has been quietly negotiating a deal that would potentially help Saudi Arabia build two reactors. ...news reports revealed that since November 2017, Perry has authorized so-called Part 810 approvals allowing U.S. companies to share sensitive nuclear information with the kingdom. The approvals were kept from the public and from Congress. The senators asked Perry to provide them by April 10 with the names of the companies that got the 810 approvals, what was in the authorizations, and why the companies asked that the approvals be kept secret. U.S. Representative Brad Sherman, a Democrat, also asked the Energy Department in

a separate letter what was in the approvals.

While 810 agreements are routine, the Obama administration made them available for the public to read at Energy Department headquarters. Lawmakers say the department is legally required to inform Congress about the approvals. Perry approved the seven recent authorizations as the administration has tried to hash out non-proliferation standards with Saudi Arabia. Such a pact, known as a 123 agreement, would have to be agreed before U.S. companies can share physical exports of materials and equipment to build reactors. The kingdom has resisted standards on reprocessing spent fuel and enriching uranium, two potential paths to making nuclear weapons.

Perry has said the 810 approvals were kept from the public for corporate proprietary reasons. He has also said that if Saudi Arabia relies on China or Russia for building nuclear reactors those two countries don't give a "tinker's damn" about non-proliferation.

The US has been competing with South Korea, France, Russia and China on a potential deal to help build reactors in Saudi Arabia. The kingdom is expected to announce the winner this year. Lawmakers from both parties have been

concerned about Saudi Arabia's bombing campaigns in Yemen, which is on the brink of famine, and the killing of journalist Jamal Khashoggi, a U.S. resident, last October in the Saudi consulate in Istanbul. Concern in Congress grew last year after the kingdom's Crown Prince Mohammed bin Salman told CBS that "Saudi Arabia does not want to acquire any nuclear bomb, but without a doubt if Iran developed a nuclear bomb, we will follow suit as soon as possible." Perry has said the 810 approvals were kept from the public for corporate proprietary reasons. He has also said that if Saudi Arabia relies on China or Russia for building nuclear reactors those two countries don't give a "tinker's damn" about non-proliferation. Many non-proliferation experts dispute the notion that a deal with China or Russia would be riskier. These people say the United States has many other levers it can pull to influence nuclear behaviour.

At another Senate hearing, the five members of the NRC, including Chairman Kristine Svinicki,

would not say whether the NRC raised any concerns over the 810 approvals in a required consultation with the Energy Department. Svinicki said the NRC's consulting role on the approvals is narrow and delegated to staff. Senator Chris Van Hollen, a Democrat who asked the question of the NRC at the hearing, told Reuters in an interview that the commissioners' lack of knowledge about the approvals was "stunning." "It's kind of scary because we do rely on them to provide input into this process and not a single commissioner knew anything about what input they may or may not have provided."

As of February 2019, there were about 50 nuclear reactors under construction around the world. As global nuclear energy capacity increases, so too does demand for the fuel that makes nuclear energy possible: uranium. Rising demand for uranium is great news for Canada, because the country is host to the world's greatest uranium reserve sitting right in the nation's heartland of Northern Saskatchewan and Alberta. Accounting for 15.5 percent of global annual uranium production, the Athabasca Basin plays a vital role.

Source: <https://www.reuters.com>, 02 April 2019.

URANIUM PRODUCTION

CANADA

Uranium Exploration in Canada: The Athabasca Basin

The world's energy future could mean very good things for Canadian uranium exploration. As countries around the world seek to increase energy capacity without raising carbon emissions, governments in developed and developing nations alike are turning back to nuclear power. As of February 2019, there were about 50 nuclear reactors under construction around the world. As global nuclear energy capacity increases, so too does demand for the fuel that makes nuclear energy possible: uranium. Rising demand for uranium is great news for Canada, because the country is host to the world's greatest uranium reserve sitting right in the nation's heartland of Northern Saskatchewan and Alberta. Accounting for 15.5 percent of global annual uranium production, the Athabasca Basin plays a vital role in securing Canada's place in the future of the global energy market.

Nuclear Energy Drives Uranium Demand: Nuclear energy output is growing steadily. According to the International Energy Agency, nuclear generation is set to rise by about 46 percent by 2040 as nuclear increasingly replaces coal and fossil fuel generation. More than 90 percent of that increase will come from China and India as the world's two fastest growing nations continue to develop and urbanize. Future supply concerns have added to uranium's outlook going forward. Kazakhstan, the world's current top uranium-producing nation, announced in late 2017

that the country would be reducing its production by 20 percent over the next three years. After a slowdown in 2017, uranium prices began to pick up in 2018, reaching US\$27.50 per pound in October 2018 up from US\$22.32 in December 2017. That steady increase is expected to continue through 2019, with an increase in global demand driving uranium prices for the foreseeable future. ...

Uranium Exploration in Canada: The Athabasca Basin is home to the largest reserves of uranium on the planet. Covering about 100,000 square kms of the Canadian Shield in Northern Saskatchewan and Alberta, the basin's surface is made up of about 100 to 1,000 meters of sandstone with high-grade uranium deposits located under the sandstone layer. The Athabasca Basin is known not just for the quality of its uranium but also the quantity, with 10 of the 15 highest-grade uranium deposits in the world located within the basin.

Some of the key deposits within the Athabasca Basin include the Phoenix, McArthur River and Cigar Lake deposits, each containing between 15 and 20 percent uranium. For those involved in uranium exploration in Canada, the Athabasca

Basin is an essential region to consider. Uranium was first discovered in the Canadian prairies in 1934, though the true value of this resource would not be fully understood until a few years later. As the end of the second world war led to the discovery of nuclear energy, however, uranium became an important military and energy resource.

After the war, as the Canadian government began allowing private uranium exploration and production, uranium for energy generation quickly became one of Saskatchewan's largest exports. In 1968, the first major uranium discovery in the Athabasca Basin was made at Rabbit Lake, which went on to produce 120 million pounds of uranium over 25 years. Since that first discovery, 18 deposits have been discovered in the Athabasca Basin, accounting for more than 1.4 billion pounds of uranium. As nuclear energy increasingly drives demand for high-grade uranium, companies with assets in the Athabasca Basin could find themselves in an advantageous position. Azincourt, for example, has acquired interests in two highly prospective uranium operations in the region. The company holds an option to acquire a 70 percent interest in the East Preston uranium project, which covers 25,329 hectares of the southwest end of the basin, making it one of the largest tenure land positions in the Patterson Lake region.

In February 2018, global mining giant Rio Tinto acquired a block of uranium properties in the Athabasca Basin from Pistol Bay Mining. With nuclear power taking on a greater role in the global energy landscape, Canada and its uranium producers are positioning themselves to benefit. According to the Canadian Nuclear Fact book 2019, uranium exports bring approximately \$1.2 billion into the Canadian economy, and Canada's uranium production is set to double from its 2012

levels by 2020. With other top uranium nations decreasing production, Canada's uranium reserves could allow the country to step up and once again become the world's top supplier. Canadian uranium will be a key asset for maintaining the country's relevance in energy markets of the future.

Takeaway: In an era that requires low carbon energy solutions, countries around the world are increasingly looking towards nuclear energy to meet demand. As nations begin to embrace nuclear energy, the demand for uranium could similarly rise. When it comes to uranium exploration in Canada, companies developing assets in the Athabasca Basin are positioning themselves to take advantage of the best source for high-grade uranium on the planet.

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Source: <https://investingnews.com>, 09 April 2019.

NUCLEAR PROLIFERATION

GENERAL

World's Nuclear Chief Says Risk of Weapons Proliferation is Rising

Nuclear weapons are easier to get than ever before, and that means new risks as more countries seek to develop their programs. "In general terms, the technology to develop nuclear weapons is an old one, dating back 70 years, and after that lots of progress has been made in technology," said Yukiya Amano, Director General of the IAEA. "You can get the information; you can get the material, the education. It's available." The nuclear weapons club has remained small; only a handful of countries have fully developed programs.

But Amano, the world's so-called nuke chief, warns that "the current environment" makes it "easier for countries to proliferate." "That is one of the reasons why we have to strengthen our

activities to prevent the proliferation of nuclear weapons and verify that all the material and equipment stay for a peaceful purpose," he said. The IAEA was formed in 1957 and is charged with promoting the safe, secure and peaceful use of nuclear technology – and preventing the proliferation of nuclear weapons. Amano, a Japanese diplomat who became head of the nuclear watchdog agency in 2009, sounded one reassuring note in a wide-ranging interview with CBS News: The threat "does not keep me up at night...the IAEA is doing its job." Here's how Amano sees the state of nuclear technology in three key countries: North Korea, Iran and Saudi Arabia.

North Korea's Nuclear Program Advancing:

Amano said that over the last decade North Korea's "nuclear program has significantly expanded." "Over the past year, activities at some facilities continued or developed further," he said. His comments come after warnings from South Korean officials and independent analysts that, with U.S. efforts to negotiate the "complete denuclearization" of the Kim regime stalled; North Korea has rebuilt its primary long-range rocket test site and is also operating its main nuclear research facility. The North has explicitly warned that it could resume nuclear and long-range missile tests. Amano said the IAEA "is the only international organization that can verify and monitor denuclearization in an impartial, independent and objective manner," but with the U.S. talks – the only real current dialogue with North Korea — going nowhere, there was little hope that inspectors could enter the isolated country any time soon. Ever hopeful, Amano noted that the IAEA was ready and able to send a team of inspectors into the country "within weeks," if an agreement were to be reached.

Iran still Sticking to Nuke Deal: "I don't see activities that are contrary to the Iran nuclear

agreement ... but we need to monitor very, very carefully," Amano said of the international agreement that the Trump administration unilaterally walked away from 2018. All of the other parties to the agreement hammered out by former President Barack Obama; Iran, Russia, China, France, Germany, Britain and the EU, are still trying to keep it viable. Under the 2015 deal, Iran agreed to limit its nuclear program in exchange for sanctions relief. The IAEA has said consistently since the agreement was reached that Iran continues to abide by it, and he

confirmed on 02 April, 2019 to CBS News that the agency's "inspectors have had access to all the sites and locations in Iran which they needed to visit." Mr. Trump had long bashed the deal as too generous to Tehran. He pulled the U.S. out for that reason — the White House has never claimed that Tehran was in violation of the deal. "So far they are implementing" the agreement, Amano said of Iran. He noted that the U.S.

is "a very important country, so, of course, it (the U.S. withdrawal) has impact."

Saudi Arabia's Nuclear Energy Bid: Saudi Arabia is eager to join the nuclear energy community, as rapid economic development has left it hungry for electricity. The kingdom is currently reviewing bids from international companies to build its two first nuclear reactors, but it is not currently held to the most rigid international standards for nuclear oversight. That, experts and the IAEA say, is a problem. The Trump administration has appeared keen, regardless, to push ahead and secure the contract to help build a Saudi nuclear energy program for a U.S. firm. The White House has said if the U.S. doesn't get the contract, a country with less interest in ensuring a verifiably safe and legal nuclear program may get it instead. Westinghouse is leading a U.S. consortium competing for the contract against companies from China, France, Russia and South Korea.

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In the late 90s the IAEA adopted a new, stricter monitoring program known as the "additional protocol." Many countries with nuclear programs, old and new, have agreed to adhere to the new oversight mechanism, but not Saudi Arabia. Amano said the additional protocol is, "a powerful verification tool that gives the Agency broader access to information about all parts of a State's nuclear fuel cycle. It also gives our inspectors greater access to sites and locations, in some cases with as little as two hours' notice."

Saudi Arabia insists it is only pursuing nuclear energy, not weapons, but remarks by the conservative Islamic kingdom's future king have led to concerns that it could change its mind on that point. In 2018, Saudi Crown Prince Mohammed bin Salman told "60 Minutes" that his country "does not want to acquire any nuclear bomb — but without a doubt, if Iran developed a nuclear bomb, we will follow suit as soon as possible." "I think there is indeed a danger of a slippery slope," Gary Sick, senior research scholar at Columbia University's Middle East Institute and a professor at the School of International and Public Affairs, told CBS News. He believes Saudi Arabia should be held to the same strict standard Iran has been. The world "should insist on the same level of assurance; (that) under no circumstances will it ever seek, develop or acquire any nuclear weapons," Sick told CBS News.

Brett Bruen, the former Global Engagement Director at the White House, told CBS News that Saudi Arabia "is precisely the sort of country that shouldn't have access to our nuclear technology. Even if we see the need for an alliance of convenience against Iran and ISIS, that doesn't necessitate that we hand over the recipe for our secret sauce." The IAEA has been working with Saudi Arabia for several years, and even the soft-spoken Amano wants additional verification for

the kingdom. "Not only Saudi Arabia, but I am asking all the countries to implement the additional protocol. This would increase confidence," Amano said.

Source: Pamela Falk, <https://www.cbsnews.com>, 03 April 2019.

Prospect of a Nuclear War 'Higher than it has been in Generations', Warns UN

In a world defined by "competition over cooperation, and the acquisition of arms, prioritized over the pursuit of diplomacy", the threat of a nuclear weapon being used is "higher than it has been in generations," the Security Council heard on 02 April, 2019.

The warning came from Izumi Nakamitsu, the UN High Representative for Disarmament Affairs, in a meeting convened in support of the NPT, ahead of the next conference to review the historic accord, scheduled for 2020. The NPT, which entered into force in 1970, represents

the only multilateral, binding commitment to the goal of disarmament by the States which officially stockpile nuclear weapons. Its objective is to prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy and to further the goal of achieving nuclear disarmament and disarmament overall. Ms. Nakamitsu said that the use of nuclear weapons, "either intentionally, by accident, or through miscalculation", is one of the greatest threats to international peace and security, and that "the potential consequences of a nuclear war would be global and affect all Member States." The Treaty, she said, is widely acknowledged as "the cornerstone of the international non-proliferation regime and the essential foundation of nuclear disarmament. Its role as a pillar of our collective security is likewise an accepted fact."

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From Disarmament Success to “Dangerous Rhetoric”:

The disarmament chief described the two pillars of the NPT – disarmament and non-proliferation — as “two sides of the same coin”, adding that “backward movement on one will result in backward movement on the other.” Unfortunately, Ms. Nakamitsu was able to cite several examples, including the use of “dangerous rhetoric” about nuclear weapons’ use; an increased reliance on nuclear weapons in security doctrines; and modernization programmes to make nuclear weapons faster, stealthier and more accurate. The durability of the NPT, which has lasted for almost half a century, cannot be taken for granted, she insisted, adding that there is currently nothing to replace the disarmament and arms control framework which is foundational to the post-Cold War era. With the Treaty coming under

With the Treaty coming under increasing stress, the upcoming Review Conference in 2020 will, be a “defining moment.” It could either highlight divisions between States and raise questions about their willingness to seek collective security for all, or present “a golden opportunity to make the practical gains that will ensure the Treaty’s continued viability.

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Iran, North Korea Nuclear Programmes ‘top of the Agenda’:

Director General of the IAEA, Yukiya Amano, also briefed the Council, reminding members of the role that the Agency plays in the implementation of the NPT; in the creation of an environment “conducive to nuclear cooperation”; and in assisting developing countries to use nuclear energy for peaceful means. However, Mr. Amano said the IAEA was facing several challenges, including the steady increase in the amount of nuclear material in circulation, the number of

Amano said the IAEA was facing several challenges, including the steady increase in the amount of nuclear material in circulation, the number of nuclear facilities under IAEA safeguards (the system of inspection and verification of the peaceful uses of nuclear materials), and continuing pressure on the Agency’s budget.

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He told the Council that monitoring the nuclear programmes of Iran and North Korea, officially known as the DPRK, are among the top items on the IAEA’s agenda. Mr. Amano said that Iran was implementing its commitments under the UN-backed Joint Comprehensive Plan of Action,

whose future has been put in doubt by the decision of the US administration to withdraw from the agreement. After 2009, he said, there have been “no credible indications of activities in Iran relevant to the development of a nuclear explosive device.” As for the DPRK, Mr. Amano said that the country’s nuclear programme has

significantly expanded over the past decade, carrying out nuclear tests on five separate occasions since 2009, despite the recent lull. With no inspectors inside the country, the IAEA monitors the situation using tools such as open-source information and satellite imagery.

Security Council Reaffirms Support for Nuclear Treaty:

In a statement released following the meeting, the Security Council announced a reaffirmation of its members’ support for the Non-Proliferation Treaty, and a commitment to “advance the goals of the

NPT as the cornerstone of the nuclear non-proliferation regime and the foundation for the pursuit of nuclear disarmament and the peaceful uses of nuclear energy.” Describing the NPT commitments taken under the treaty as viable and mutually reinforcing, the statement underscored the need for its full implementation, and the

importance of achieving universal adherence to the Treaty. The Council members agreed that the 2020 NPT Review Conference will provide an opportunity for an unambiguous reaffirmation of commitment to the Treaty, a commemoration of its historic achievements, and the strengthening of the nuclear-disarmament and non-proliferation regime.

Source: <https://news.un.org>, 02 April 2019.

NUCLEAR NON-PROLIFERATION

GENERAL

Deep Divisions Challenge NPT Meeting

Long-standing disputes about nuclear non-proliferation and disarmament show no signs of easing as nations meet in April for the final preparatory meeting before the 2020 review conference for the NPT. The 2019 NPT Preparatory Committee will meet from April 29 to May 10 in New York. Although Shahrul Ikram, permanent representative of Malaysia to the United Nations, was originally slated to chair the meeting, he has been replaced by Syed Mohamad Hasrin Aidid, the Malaysian ambassador to the UAE.

Despite recent efforts to make progress on the treaty's core contentious issues, including nuclear disarmament and non-proliferation, deep divisions remain and have worsened in some ways. Topping the list of issues dividing NPT parties is the pace of disarmament by nuclear-armed nations. Since 2018, the US has sought to advance a controversial disarmament initiative, U.S.-Russian relations have further deteriorated, and nuclear-weapon states remain frustrated by the 2017 Treaty on the Prohibition of Nuclear Weapons (TPNW). At the 2018 session of the preparatory committee, the U S outlined its new approach to nuclear disarmament in a working paper titled "Creating the Conditions for Nuclear Disarmament." The approach was renamed

"Creating an Environment for Nuclear Disarmament" (CEND), Andrea Thompson, U.S. undersecretary of state for arms control and international security, told a conference in Washington in March, after some states raised concerns about the word "conditions."

The U.S. initiative calls for convening working groups with representatives from 25 to 30 regionally and politically diverse states, according to Christopher Ford, U.S. assistant secretary of state for international security and non-proliferation, who described the plan in December 2018 remarks. Ford said implementation planning for the working groups would begin by the 2019 session of the preparatory committee and the groups would be "in full swing" by the 2020 NPT Review Conference.

The United States insists the approach is a good-faith effort to advance disarmament under challenging security conditions, but several states are skeptical.

"International security will not be advanced, nor the treaty preserved, by nuclear-weapon states creating doubt about their

intention ever to fulfil their disarmament obligations," New Zealand representative Dell Higgie told the preparatory committee on April 23, 2018. Many states have expressed interest in taking part in the initiative, a State Department official told *Arms Control Today* March 21. The Netherlands announced in January that it would host an expert conference in Geneva on April 15 to "stimulate the dialogue initiated by the U.S. NPT working paper." Meanwhile, U.S.-Russian relations have continued to worsen since the 2018 session of the preparatory committee, particularly highlighted by the U.S. announcement that it intends to withdraw from the INF Treaty in August. Poor U.S.-Russian relations caused turmoil at the 2018 meeting, as Russia criticized the U.S. withdrawal from the multilateral agreement that capped Iran's nuclear activities, and the United

Since 2018, the US has sought to advance a controversial disarmament initiative, U.S.-Russian relations have further deteriorated, and nuclear-weapon states remain frustrated by the 2017 Treaty on the Prohibition of Nuclear Weapons (TPNW). At the 2018 session of the preparatory committee, the U S outlined its new approach to nuclear disarmament.

States accused Russia of using chemical weapons and violating the INF Treaty. Still, the five NPT nuclear-weapon states held a successful meeting in Beijing in late January, Thompson said.

The 2019 preparatory committee session will be the second NPT meeting since the July 2017 adoption of the nuclear prohibition treaty. Seventy nations have signed the treaty, and 22 have ratified it, nearly half of the 50 ratifications needed for the pact to enter into force. At the 2018 preparatory committee meeting, France and Russia devoted paragraphs of their statements to condemnation of the treaty, while dozens of states welcomed its adoption. Robert Wood, U.S. ambassador to the UN Conference on Disarmament, claimed that states supporting the prohibition treaty tried to “undermine the NPT.”

To clarify, the State Department official told *Arms Control Today* that “we do not intend to make opposition on the TPNW the centerpiece of our approach to disarmament” at NPT meetings and that the United States will focus instead on promoting CEND. Another long-standing point of contention among NPT parties is the pursuit of a zone free of weapons of mass destruction in the Middle East. At the 2019 preparatory committee meeting, this debate will be affected by a new U.S. approach and a UN conference later this year. The United States introduced a divisive working paper at the 2018 NPT meeting that encouraged promoting conditions conducive to a zone and stated that the “NPT review cycle cannot be the primary mechanism for progress” on the zone.

The Non-Aligned Movement, the African Group, and the Arab League pushed back in statements at the 2018 meeting, contending that the NPT was indefinitely extended in 1995 in part due to a pledge to establish the zone. The State Department official said that “some Arab states sought to misrepresent the paper as an effort to impose additional preconditions,” arguing that the U.S. approach “remains the most viable and

productive way ahead.”

In November, the UN secretary-general will convene a conference in New York to make progress on creation of the zone, Rafael Grossi, Argentine permanent representative to the International Atomic Energy Agency, and the likely chair of the 2020 review conference, told a Washington meeting in March. The UN General Assembly First Committee approved the UN conference in an October 2018 resolution, although the United States, Israel, and Micronesia voted against it and 71 others abstained.

A rare point of agreement among NPT states surrounds the issue of the right to peaceful nuclear energy for all NPT states. At the Washington meeting, Grossi emphasized the positive contribution of the right to nuclear energy and suggested convening regional working groups and involving stakeholders from the nuclear industry and regulators leading up to the 2020 review conference. Some experts, however, have expressed concern that some NPT

states could object to a focus on nuclear energy as a diversion from making progress on disarmament or the WMD-free zone in the Middle East.

Source: <https://www.armscontrol.org>, 01 April 2019.

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NUCLEAR SAFETY

EU-VIETNAM

EU Helps Vietnam Enhance Nuclear Safety Management

Vietnam has improved its nuclear safety management capabilities under a three-year cooperation project with the EU. The project, which was carried out from May 2016 to April 2019, aimed to enhance the capability and effectiveness of the Vietnamese regulatory authority and its technical support unit in

managing nuclear safety in accordance with international standards, officials said at a conference held in Hanoi on 04 April, 2019, to review the project. To achieve these goals, the project helped Vietnam develop a legal and regulatory framework on nuclear safety; develop a quality management system for the agency in managing nuclear facilities; enhance Vietnam's capability to independently assess and appraise safety records; build a human resource development plan and a sustainable training program for the agency; build Vietnam's nuclear inspection capacity; improve transparency and public information.

Vietnam's experts and officials in nuclear safety have had the opportunity to attend conventions, get general and practical training at nuclear research facilities and management organizations in France, Germany, Belgium and Finland. Speaking at the conference, Vietnam's Minister of Science and Technology Chu Ngoc Anh said the project was implemented on schedule and met its initial objectives. The project has played an important part in the completion of a number of draft documents on nuclear safety, nuclear inspection and incident response.

Vietnam's state management on nuclear and radiation safety has also built an integrated management system in accordance with advanced international standards and formulated a human resource development plan. ... Ambassador Bruno Angelet, Head of Delegation of the European Union to Vietnam, stressed that in recent times, the EU and Vietnam have cooperated not only in the nuclear sector but also in commerce, energy, investment and national security and defense. Through this project, the EU hopes to help Vietnam ensure that its nuclear regulatory agency is capable of managing nuclear safety with other countries in the region, Angelet said. Vietnam is running one nuclear reactor in Da Lat in the Central Highlands. The country's legislators scrapped nuclear power plans in

November 2016 citing high costs.

Source: <https://e.vnexpress.net>, 05 April 2019.

UAE

FANR Launches Legal Developpee Programme

First of its kind in the UAE, the Legal Developpee Programme to provide UAE nationals with expertise in local and international nuclear law. The Federal Authority for Nuclear Regulation (FANR), the nuclear regulator in the UAE, has launched a Legal Developpee Programme designed to train UAE nationals in nuclear law and prepare them for employment at the Legal Affairs Department of FANR. The first-of-its-kind in the UAE, the programme forms a part of FANR's strategy to build long-term sustainability by developing Emirati talent in the nuclear energy sector and related fields.

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The programme was developed by FANR in partnership with one of the largest international law firms having extensive experience in the field of nuclear law. Aimed at law graduates interested in entering the UAE's nuclear energy sector, the new programme provides talented UAE nationals with the fundamental

knowledge necessary to understand the legislation and agreements related to the FANR's day-to-day operations, the UAE peaceful nuclear energy program, and other aspects of international nuclear law. "Ensuring the sustainability of the UAE's nuclear energy sector is a top priority for FANR, and the Legal Developpee Programme directly supports our mission to develop Emirati capabilities in the nuclear field," said Shaima Al Mansoori, Director of Education and Training at FANR. ...

The Legal Developpee Programme is based on a modular approach providing a mix of classroom lectures, course work, legal research assignments and on-the-job training. Broken down into four modules over the course of 2019, the programme educates participants on various aspects of nuclear law, including UAE legislation. Each of the

four modules consists of one week of lectures on a specific area of nuclear law to be followed by three weeks of training that will allow the interaction of the programme participants with FANR's four technical departments in the Operations Division of FANR, namely the Safeguards Department, Nuclear Safety Department, Nuclear Security Department and Radiation Safety Department, and will allow them to learn the technical aspects of FANR's work that require support from FANR's Legal Affairs Department.

The programme also includes a two-week internship in the law firm office abroad. Human capacity development and the sustainability of the UAE's peaceful nuclear energy program are of paramount importance to FANR. Currently, FANR has over 240 employees of which 66% are UAE nationals, many of whom hold key leadership and technical positions in nuclear safety, security, safeguards and radiation protection.

Source: <https://www.zawya.com>, 03 April 2019.

UZBEKISTAN

Uzbekistan Starts Site Selection Process for First Reactors

Uzbekistan has initiated the process to choose a site for its first nuclear power plant and aims to grant a site licence in September 2020, local officials have confirmed to the IAEA. Uzbekistan is among about 30 countries that are considering, planning or actively working to include nuclear power into their energy mix.

At the request of Uzbekistan's government, the IAEA and the newly established Nuclear Energy Development Agency UzAtom held a workshop in February in Tashkent on safety and non-safety aspects to be considered in siting and site evaluation for nuclear power plants, the Vienna-based agency said. The workshop with participation of UzAtom, the nuclear regulatory body and other relevant national organisations focused on IAEA safety review services, safety

standards and other resources supporting the siting and site evaluation for nuclear power plants.

The workshop introduced the IAEA Milestones Approach for the development of a new nuclear power programme. It lists 'site and supporting facilities' as one of 19 nuclear infrastructure topics that would require action during the development of a nuclear power programme.

In line with this, the IAEA provides integrated services, including on safety, security, legal and regulatory frameworks, human resource development, emergency planning and safeguards. These include peer reviews and advisory missions, such as the Integrated Nuclear Infrastructure Review and the Site and External Events Design Review Service. Jurabek Mirzakhmudov, director general of UzAtom,

told *World Nuclear News* in December that current projections indicate Uzbekistan will need to double its electricity output by 2030 in order to meet demand. The country's parliament last year ratified the Paris Agreement on Climate Change, and is committed to "dramatically reducing" its use of natural gas for power generation. It now plans to make the country's transmission systems more efficient, to renovate its existing gas-fired and hydropower facilities, and to build new ones, and to adopt renewable energy sources such as solar. It has also have chosen to build a Russian-designed twin VVER unit nuclear power plant with a capacity of 2400 MWe. Mirzakhmudov said the plant is expected to generate about 15% of Uzbekistan's power needs by 2030.

Source: <http://www.world-nuclear-news.org>, 09 April 2019.

NUCLEAR WASTE MANAGEMENT

ESTONIA

IAEA Mission Says Estonia Committed to Safe Management of Radioactive Waste, Sees Areas for Further Enhancement

An IAEA team of experts said Estonia's national programme for managing radioactive

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waste demonstrated a commitment to safety, while also noting areas where it could be further enhanced. The Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) team concluded a nine-day mission to Estonia on 1 April. The mission was requested by the Government of Estonia and hosted by the Ministry of Environment, with the participation of the Environmental Board, Environment Inspectorate and A.L.A.R.A. Ltd., the state-owned radioactive waste management organization. ARTEMIS missions provide independent expert advice from an international team of specialists convened by the IAEA. Reviews are based on the IAEA safety standards and technical guidance as well as international good practices. The mission to Estonia aimed to help the country meet European Union obligations that require an independent review of national programmes for the management of radioactive waste and spent fuel.

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While Estonia does not operate any nuclear power plants, it manages small waste streams from the use of radioactive sources in industry, medicine and to a small extent in education and research. Most of the waste will arise from decommissioning Soviet-era facilities, including a former repository and two defueled reactors. "Estonia has adopted a coherent approach to ensure safe and effective management of radioactive waste, including plans to enable the safe decommissioning of legacy facilities and final disposal of all the country's radioactive waste," said ARTEMIS team leader Cherry Tweed, Chief Scientific Adviser at Radioactive Waste Management, United Kingdom. The ARTEMIS review team comprised four experts from Hungary, Portugal, Switzerland and the United Kingdom as well as three IAEA staff members. The team observed that many aspects relevant to the safe and effective management of radioactive waste in Estonia are in place. Recommendations and suggestions provided by the team included:

- The Government should ensure that all responsible state bodies take an active role in the effective delivery of their responsibilities on

radioactive waste management.

- The Government should ensure that mechanisms are in place to provide the necessary human, technical and financial resources to deliver all aspects of the national programme.

- A.L.A.R.A. Ltd. should develop a preliminary safety case with supporting safety assessments for all proposed disposal facilities.

"Even though the production of radioactive waste is very limited in Estonia, it has been important for us to seek confirmation that our plans and strategies for the safe and effective management of radioactive waste are adequate," said Meelis Münt, Secretary General of the Ministry of Environment. "The recommendations will help us

to further enhance compliance with international safety standards." Peter Johnston, Director of the IAEA's Division of Radiation, Transport and Waste Safety, said authorities in Estonia were

transparent and constructive in their discussions. "Estonia has prepared well for receiving this ARTEMIS mission, which aims to help further develop the effective delivery of its commitments to the continuous improvement of the safe management of radioactive waste," Johnston said. The final mission report will be provided to the Government in about two months. The Government has already decided to make the report public.

Source: <https://www.iaea.org>, 03 April 2019.

GENERAL

Keeping Nuclear Power Safe

Nuclear energy is clean, powerful, affordable, and zero-emission. A new study uses the Canadian Light Source (CLS) at the University of Saskatchewan to help ensure that waste from nuclear power plants remains safe and secure for thousands of years to come. The project, led by Dan Kaplan and Dien Li, researchers at the Savannah River National Laboratory in South Carolina, looks at storing iodine, which is generated during uranium use, including in

nuclear power generation. Among the challenges of iodine management is its slow rate of decay—it has a half-life of 16 million years. Iodine is volatile and highly mobile in the environment, making containment critically important in nuclear waste management. Currently, nuclear waste disposal sites use Ag-zeolite to sequester iodine from nuclear waste streams, which is then encased in concrete to prevent leaching. “We want to make sure that iodine is not leaching out in the long term so we can put the concrete underground without any risk to the public,” said Li who conducts a diverse range of research focused on mines and site remediation.

What has been missing until now is a detailed study of how effective various types of concrete are at containing iodine-storing Ag-zeolite, and what specific forms of iodine might escape over time. Li and his colleagues used the advanced technology available at the CLS to see which of two types of concrete work best at containing three different chemical forms of iodine. Notably,

they tested the most commonly used waste containment material, which is concrete with slag. Slag, he explained, is a commercially available chemical mixture composed largely of coal ash produced in coal-burning power production. “The CLS allowed us to precisely determine what kind of iodine is most stable and what form may leach out of the concrete,” said Li.

This will help improve iodine management and disposal at sites worldwide. Their study, published in *Environment International*, showed the cements with slag “have problems with long-term containment of iodine,” while they work very well at containing other radioactive elements. “Managing nuclear waste is very complicated,” says Li. “Moving forward, there is a lot more research to do,” he said. “The amount of iodine waste is going to keep increasing so we need to be looking at new technologies or products to see if they work well with other contaminants as well as iodine.”

Source: <https://phys.org/news, 10 April 2019>.

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Centre for Air Power Studies

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

Centre for Air Power Studies

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