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**OPINION – Manoj Joshi**

**India Under Pressure to Upgrade Nuclear Arsenal as Major Powers Expedite Modernisation Plans**

When the most powerful nation on earth feels that the threats it faces are increasing, it touches off dangerous eddies that can destabilise global security. The United States has signalled that this is, indeed, the case. The December 2017 National Security Strategy (NSS) declared that China and Russia were “attempting to erode American security and prosperity”. In January 2018, the US adopted a new National Defense Strategy (NDS) whose unclassified summary says the principal problem confronting the US is the erosion of American military advantage over China and Russia in three key theatres — Indo-Pacific, Europe and West Asia. So, it’s not surprising that the Nuclear Posture Review issued shortly thereafter called for the US to expand its reliance on nuclear forces to protect the country and reassure allies. In addition to modernising ageing forces, it said there was a need for two new missiles, a low-yield SLBM and a new SLCM.

The US says it is reacting to developments in Russia, North Korea, Iran and China. The North Korean thermonuclear test and the sophistication of its long-range missiles was no doubt a major factor. But so were Russian developments in testing and deploying a new line of strategic nuclear-capable

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missiles and hypersonic vehicles capable of outmanoeuvring US defenses. The US cited the Russian deployment of a new GLCM, the 9M729, for its pull-out of the INF Treaty. By their test of hypersonic glide vehicles, manoeuvring and

multiple warhead systems, the Chinese, too, signalled that their aim was to defeat potential US ABM systems.

Clearly, some of this has been triggered by the US decision to scrap, rather than renegotiate important arms control treaties like the 1972 ABM Treaty.

American advances in intelligence, surveillance and reconnaissance, as well as precision strikes, have had their own chilling effect on the Russians and the Chinese. Contemporary political developments and advances in technology are challenging the uncomfortable but useful notion

of MAD that has ensured nuclear peace so far. Countries like India, a modest nuclear weapons power, which faces two nuclear adversaries, will now have to take them into account.

First, India's NFU pledge has been challenged by the low-yield theatre weapons deployed by Pakistan which believes theatre weapons are crucial for their defense against India's conventional superiority. But even a low-yield weapon is thousands of times more destructive than a conventional one. As of now India has promised "massive retaliation" against any nuclear use. The way it sees it is similar to the position of US defense secretary James Mattis who said in February 2018 "I don't think there's any such thing as a tactical nuclear weapon. Any nuclear weapon used anytime is a strategic game-changer."

Second, India has to worry about a modernised Chinese arsenal that can defeat American counter-measures. In view of India's somewhat primitive arsenal, the Chinese may be encouraged to think they can get away with a disarming first strike, eroding the stability provided by the idea of MAD. Nuclear forces being upgraded and modernised globally are pressuring India once again, just as once the perpetual extension of the NPT and the CTBT pushed New Delhi across the nuclear threshold.

Source: <https://www.firstpost.com>, 29 November 2018.

**OPINION – Thomas Karako**

**Beyond the Radar Archipelago: A New Roadmap for Missile Defense Sensors**

In missile defense circles, commentators frequently remark that there are only so many

**One is struck by the fact that the Pentagon seems to have doubled down on a strategy of building a chain of sea- and ground-based radars, both on Pacific islands and elsewhere. Call it the radar archipelago. The expansion of long-range missile defense sensors over the past 16 years has, with some exceptions, been nearly synonymous with a gradual increase of large, surface-based radars.**

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islands or ships in the Pacific on which to put radars. Reading through recent missile defense budget requests, however, one is struck by the fact that the Pentagon seems to have doubled down on a strategy of building a chain of sea- and ground-based radars, both on Pacific islands and elsewhere. Call it the radar archipelago.

The expansion of long-range missile defense sensors over the past 16 years has, with some exceptions, been nearly synonymous with a gradual increase of large, surface-based radars. And this virtual island chain of radars is growing. In addition to a nearly complete radar in Alaska, \$2.5 billion has been allocated over the next five years for the construction of two Pacific radars just to address the threat from North Korea. Once built, these will supplement the current handful of terrestrial radars that include one at Clear, Alaska, the floating Sea-Based X-Band Radar, and two additional ground-based radars in Japan.

Although well-enough suited to limited ballistic missile threats, a thinly layered sensor architecture with many single points of failure is ill-equipped for the specter of complex and integrated air and missile attack. In short, today's architecture is all too susceptible to suppression. The joint force faces a more complex and contested aerial threat environment than ever before. Threats have become more diverse, including drones and cruise missiles that can get around sectored sensors with a limited field of view, maneuvering ballistic missiles, radiation-seeking missiles, and hypersonic glide vehicles. As seen with tactics and techniques employed in Yemen, Syria, and Ukraine, sophisticated adversaries attack from various directions,

altitudes, and velocities — and combine with electronic countermeasures to degrade radars. Meeting this challenge requires a new roadmap towards a more distributed, diverse, layered, and survivable missile defense sensor suite.

**Today's Sensor Shortcomings:** When it comes to missile defense, it's all about sensors. An interceptor is only as good as the sensors that tell it where to go and what to kill. Today's missile defense sensors have several major limitations: a relatively small number of dedicated assets with high-emission signatures that can be easily identified and themselves targeted; sector coverage that makes it possible for enemy missiles to get through; over-reliance on one phenomenology, namely radiofrequency or radar; surface-basing limited by the geographic horizon; insufficient force protection of high-value assets against asymmetric threats like unmanned aerial vehicles; and insufficient integration with non-dedicated sensor assets. These shortcomings represent

**The top priority remains a space-based sensor layer for persistent, birth-to-death tracking and discrimination. Each of the past six administrations has been committed on paper to the utility of a space layer for long-range missile defense — but one has not yet been fielded. The time for studies is over.**

gaps that adversaries can exploit. To borrow a phrase from Gen. John Hyten, head of U.S. Strategic Command, reliance on any small handful of assets makes them “juicy targets.”

**The Way Forward:** The roadmap for a more capable and survivable sensor architecture should incorporate at least five characteristics: domain rebalance, with a more extensive use of platforms at high altitudes and in space; disaggregation and dispersal of more numerous, smaller, and cheaper sensors; diversity of technologies and use of a wider range of the electromagnetic spectrum, especially with passive and low-emitting sensors; more integration of sensor data from non-dedicated tactical assets; and advanced radar capabilities and operations.

**Domain Rebalance:** Surface radars look out and up, but the threat requires sensors that also look down and across. The first sensor shift should be a domain rebalance, a shift from today's near-total

reliance on surface-based assets to a much broader mix of platforms in a variety of domains; specifically, a shift upwards to platforms in the air, at high to very high altitudes, and in orbit. The top priority remains a space-based sensor layer for persistent, birth-to-death tracking and discrimination. Each of the past six administrations has been committed on paper to the utility of a space layer for long-range missile defense — but one has not yet been fielded. The time for studies is over.

A mix of elevated assets provides numerous benefits. Orbits are fixed and predictable, so unmanned fixed-wing aircraft and lighter-than-air vessels can make a substantial contribution in addition to the space sensor layer. High-altitude platforms can make up in mobility, speed of fielding, and cost what they cannot provide in global coverage. Australia's E-7A Wedgetail, for instance, has demonstrated significant potential for air defense applications. Especially for cruise missile defense, some alternative overhead

solution is needed to replace the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) aerostat radar.

**Disaggregation:** The architecture must also be more disaggregated. For the U.S. Navy, distributed lethality (or distributed maritime operations) complicates the targeting and surveillance problem of an adversary by distributing strike assets on everything that floats. The same applies to sensors: Broadening the attack surface improves survivability and resilience, presenting an adversary with many aimpoints rather than few. But with resources being finite, we cannot simply multiply the number of large and expensive assets. A set of more numerous, smaller, cheaper targets would make it considerably harder for an enemy to defeat them all.

With respect to space sensors, Under Secretary of Defense for Research and Engineering Michael Griffin recently stated, “I want us to be as widely

distributed over as many choices of orbital regime as we can effectively use...to pose the adversary with such a difficult problem that they will choose not to fight.” Sensors in both low- and medium-earth orbits are more capable and survivable than a constellation at one altitude.

The disaggregation logic also applies to terrestrial assets. As the National Defense Strategy notes, the survivability and resilience of the force requires a transition “from large, centralized, unhardened infrastructure to smaller, dispersed, resilient, adaptive basing.” The multiplication of sensors within each domain likewise complicates an adversary’s surveillance and targeting. Adding appropriate active decoy systems and other means of deception would further complicate an enemy’s battlefield awareness. In short, distribution forces an adversary to engage in its own sort of Scud hunting, which is never easy. Whether on the surface, in the air, or in space, the principle of distribution should be widely applied to missile defense sensors and interceptors alike.

**Diversity:** Third, the sensor architecture should be more technologically diverse. In little-noticed remarks earlier this year, Vice Chairman of the Joint Chiefs of Staff Gen. Paul Selva warned about overreliance on radiofrequency for communication and command and control: “It doesn’t have to be a [radiofrequency] game. It’s an RF game because we choose to make it so.”

The same goes for sensors. Radar has been around nearly a century, and adversaries have had decades to monitor and develop countermeasures to air and missile defense radars. There will always be a place for radar to cut through weather and sharply illuminate a target, but non-radiofrequency emitters, including lasers, would improve tracking and discrimination and complicate targeting, surveillance, and countermeasure tasks for an adversary.

The future sensor set should prioritize sensor types that are passive, lower-emitting, and harder to negate. Electro-optical, infrared, lasers, and other forms of directed energy have benefits against certain threats and may have much lower emission signatures.

The multispectral targeting system on the MQ-9 Reaper is a kind of poster child for more diversified, elevated, and lower-emitting sensors. A constellation of high-altitude, long-endurance unmanned aerial vehicles with various sensor payloads could be operated over the Pacific to both fill gaps in radar coverage and buy time until a space layer is orbited. Unlike ground-based radars and orbiting sensors, their locations would not be easily predictable.

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**Opportunistic Integration:** Another key improvement lies with integration: the idea of opportunistically fusing sensor data from non-dedicated platforms across the joint force. Today’s missile defense architecture relies on a fairly static, closed set of

dedicated sensor assets that are more or less assigned to the mission. An alternative approach would be to accept a bit more day-to-day risk while anticipating increased capability in the event of a crisis. Elevated tensions with, say, North Korea would result in aerial or maritime sensors surging to the area. Platforms that are not assigned to the missile defense mission, say, an artillery radar or F-35s in the area, may very well pick up a missile launch, acquiring information that should then be relayed to air defense commanders.

Requiring missile defense command and control to integrate sensor data from a much wider set of sources would be a sort of culture change for the missile defense community. But it would also be a concrete application of the National Defense Strategy’s approach to “dynamic force employment.” Several months ago, Missile Defense Agency Director Lt. Gen. Samuel Greaves gave voice to this need: “Our job is to look outside



of the classic missile defense system...and look for sensors and shooters that would be able to contribute when integrated into the [Ballistic Missile Defense System].”

The Army’s Integrated Air and Missile Defense Battle Command System and the Navy’s Cooperative Engagement Capability have made progress in fusing disparate sensor data into a single air defense picture. But much more should be done, especially with non-radar sources and those employing different frequencies, waveforms, and timing characteristics. The Navy has experimented with integrating the F-35 Multifunction Advanced Data Link into its Aegis Combat System, but this has not yet translated to an operational configuration that can be fielded. Wringing additional data out of existing sensors would yield significant improvements in situational awareness and capability.

To realize this vision, the Command and Control, Battle Management, and Communications network — which manages all elements of the Ballistic Missile Defense System — will require substantial improvement to connect with non-dedicated sensors. Given that the spectrum of air and missile threats differ dramatically by trajectory, range, and altitude, it is difficult to orchestrate engagements from today’s battle management structure. Further challenges include how to move between centralized and federated command and control for the engagement of threats that are very close or half a world away.

**Better Radars:** Finally, radars should perform better. Surface-based radars will remain a critical element of the missile defense architecture for the foreseeable future. Given the Pentagon’s urgency to increase the speed at which new capabilities are fielded, marginal improvements here could yield relatively more substantial improvements in the near term.

A sort of radar renaissance is underway, the results of which are only now beginning to reach the field. Many radars fielded today date to the 1970s and still use vacuum tubes. But emerging solid-state radar technologies, scalable construction, and increasingly digitized concepts hold considerable promise for more efficient energy use and beam direction, the ability to use multiple frequency bands, advanced waveforms to support multiple missions, and improved resistance to jamming and other countermeasures. With digitization, of course, comes the perennial need for robust cyber protection.

**Low-hanging fruit in the area of radar improvement includes incremental changes to the program of record. Long-serving Aegis SPY-1 radars could benefit from near-term modernization, but the Navy could also accelerate the SPY-1’s planned replacement with the SPY-6, both afloat and ashore. Today’s Patriot and THAAD radars also need upgrading.**

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modernization, but the Navy could also accelerate the SPY-1’s planned replacement with the SPY-6, both afloat and ashore. Today’s Patriot and THAAD radars also need upgrading.

The Pentagon should also explore more imaginative concepts. In contrast to today’s reliance upon fixed radars that both emit and receive pulses of energy, enormous potential may be found with network cooperation and extensive use of semi-active, bi-static, or multi-static configurations. In these configurations, some elements would emit energy, but most would be passive. Smaller and less capable radars would acquire resilience through numbers on the principle of distribution, whereas the handful of larger ones could have dedicated force protection against aerial threats. Swarms of cheap, disposable emitters could be used to illuminate targets, the reflected signals from which other passive receivers would then detect. High-value emitters must be protected or disguised, but lower cost emitters and passive receivers might not be.

Another option is to disperse radar modules — the elements of a radar that emit and receive energy — and then coherently integrate their

returns. One might, for instance, take apart the modules of a Long-Range Discrimination Radar or a SPY-6 and distribute them across an area. Instead of one big, self-designating target, an adversary would have to pick among many targets to discern critical elements to attack. Although coherent integration of disaggregated beams presents significant challenges for precision timing and computing, the boost to survivability and resilience could be tremendous. Large radars will surely retain an important place, but the overall landscape may be more of a high-low mix: a few high-end assets working together with many more of lesser capability.

It is also time to decisively move away from sectored radars — those with a limited field of view. The radars for Patriot, THAAD, and Ground-based Midcourse Defense are almost entirely sectored, but air and missile threats come from all directions. Taking a page from the Aegis Combat System, the default expectation should be that all dedicated air and missile defense radars have 360-degree coverage to prevent being attacked from behind. Current plans for the sectored Hawaii radar should be adjusted so it can later be expanded to have radar faces in all directions, rather than only one. And whether for budgetary reasons or urgency to field, the Army should reconsider its apparent decision to go soft on relaxing 360-degree coverage for its Low Tier Air and Missile Defense Sensor. Plans to upgrade the capability of the TPY-2 radar for THAAD batteries might also incorporate some means to supplement its 180-degree coverage.

**The Sensor Archipelago:** The roadmap that brought about the radar archipelago supporting today's Ballistic Missile Defense System was designed in a world focused on limited ballistic missile threats. The future will require much more than just big radars on islands and ships. The image of an archipelago may, however, remain a useful

guide, for it points to the crucial principle of distribution. According to press reports, the Pentagon is on the verge of releasing its Missile Defense Review. Adapting today's sensor architecture will be one of the most critical steps to reorient U.S. missile defenses to the complex realities of air and missile battle. Such an adaptation would benefit from more elevation, disaggregation, diversity, integration, and advanced capabilities.

Whether the forthcoming policy review endorses these characteristics remains to be seen, to say nothing of the budgetary and programmatic implementation needed to realize this kind of vision. But if the U.S. missile defense posture is to be reoriented to near-peer adversaries, it will require a radically different sort of sensor archipelago.

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Source: <https://warontherocks.com>, 28 November 2018.

**OPINION – Daryl G. Kimball**

**U.S. INF Treaty Termination Strategy Falls Short**

Secretary of State Pompeo today declared Russia in material breach of the landmark 1987 INF Treaty and announced that the United States plans to suspend U.S. obligations under the treaty in 60 days unless Russia returns to compliance. In a new statement on the INF Treaty also released on December 04, 2018, NATO foreign ministers collectively declared for the first time “that Russia has developed and fielded a missile system, the 9M729, which violates the INF Treaty. The ministers also stated: “It is now up to Russia to preserve the INF Treaty.” In delivering the Trump administration's ultimatum, Pompeo expressed the “hope” that Russia will “change course” and return to compliance with the treaty. But hope is not a strategy.

If NATO member states want to preserve a key arms control treaty that has enhanced their

security for more than two decades, they will insist that the United States and Russia exhaust diplomatic options and should put forward proposals for how the two sides can resolve issues of concern about treaty implementation. Unfortunately, Pompeo provided no indication that the administration wants to make a final effort to save the treaty by engaging in talks with Russia to address the compliance concerns raised by Washington and Moscow. Notably, the NATO foreign ministers' statement does not express support for, or even reiterate, Pompeo's ultimatum that the United States will suspend its obligations in 60 days unless Russia returns to compliance.

Once a withdrawal notification is issued, Article XV of the treaty requires the United States to wait six months before it can leave the agreement. Pompeo said the administration will issue a withdrawal notice in 60 days. Reports indicated that the Trump administration planned to give formal notice of withdrawal from and suspend implementation of the treaty today, but the administration was persuaded to postpone that action for two months following President Trump's meeting with German Chancellor Merkel on December 01, 2018 at the G-20 summit in Argentina.

**European Concerns:** Several NATO allies have expressed concern about president Trump's announcement in October 2018 that he planned to withdraw from the treaty and that they had not been consulted about the decision. For

example, the European Union declared in a statement that the United States should "consider the consequences of its possible withdrawal from the INF on its own security, on the security of its allies and of the whole world." Russia's production, testing, and deployment of an illegal, ground-launched cruise missile with a range between 500 to 5,500 kilometres is unacceptable and merits a strong response from all nations that value arms control and the reduction of nuclear risks. Without the INF Treaty, we will likely see the return of Cold War-style tensions over U.S. and Russian deployments of intermediate-range missiles in Europe and perhaps elsewhere.

**A Path Forward:** Clearly, diplomatic options to resolve the INF crisis and avoid a new missile race in Europe (and Asia) have not yet been exhausted.

To date, diplomatic efforts to resolve the issue have been limited and unsuccessful. Since Trump took office, U.S. and Russian officials have met only twice at the working level to try to resolve the compliance dispute, the last time being in June 2018. However, the delay of the suspension notification provides little time and will be of little value unless NATO governments, along with Russia and the United States, use the time productively. The focus should be on negotiating a solution that addresses U.S. and NATO concerns about Russia's noncompliant 9M729 missile and addresses Russia concerns about, in particular, U.S. Mk-41 Aegis Ashore missile-interceptor launchers in Romania (and by 2020 in Poland) that could be used for offensive missiles.

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Averting the collapse of the treaty at this point requires NATO members (starting at the NATO foreign ministerial December 04-05, 2018 in Brussels) to call on the United States and Russia to immediately meet to redouble off-and-on diplomatic efforts to resolve the INF Treaty compliance crisis. It is disappointing the NATO Secretary General Jens Stoltenberg has not yet done so. On November 26, 2018 Russian Deputy Foreign Minister Ryabkov said that Russia is “open to any mutually beneficial proposals that take into account the interests and concerns of both parties.” If Washington is serious about removing the 9M729 missile threat, NATO should explore what that means and table a serious proposal.

If Russia is serious about preserving the INF Treaty, it will agree to discuss U.S. concerns, agree to implement transparency measures, and, if the 9M729 is found to be noncompliant, either modify or eliminate the illegal missile as a “sign of good faith.” In addition, the United States needs to acknowledge Russia’s concerns about U.S. implementation of the agreement, specifically the Mk-41 launchers for the Aegis ashore missile interceptors in Romania (and soon in Poland) and agree to transparency measures that reduce concerns that the launchers could be used to deploy offensive missiles.

There is precedent for using diplomacy to resolve treaty violations. In the 1980s, President Ronald Reagan continued to observe the 1972 Anti-Ballistic Missile Treaty with Moscow despite its determination that a large radar located at Krasnoyarsk in Siberia violated the treaty. It also

engaged in negotiations with the Soviet Union on the INF Treaty and what became the Strategic Arms Reduction Treaty during this period. It took time, but diplomacy worked, and the Soviets eventually tore down the radar.

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capability beyond the 500km range limit set by the INF Treaty and has been deployed in areas of Russia that enable it to reach parts of Europe. But even without the INF Treaty, there is no military need for the United States to develop a new and costly treaty-noncompliant missile for deployment in Europe.

The United States can already deploy air- and sea-launched systems that can threaten the same Russian targets that new ground-launched missiles prohibited by INF Treaty would. In addition, no European nation has agreed to host such a missile, which could take years to develop, and even if one did, it would be a significant source of division within the alliance—one Russia would be eager to try and exploit.

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Instead of accepting the U.S. intention to begin “developing and deploying” new ground-based missiles to counter Russia, the U.S. Congress, as well as NATO member states should insist that if the United States and Russia do not find an 11th hour diplomatic solution to preserve the INF Treaty, they will at least pledge not to be the first to deploy intermediate-range missile systems anywhere in or in-range of NATO Europe. And regardless of the fate of the INF Treaty, responsible governments and members of the U.S.



Congress should also insist that Presidents Trump and Putin agree to extend the 2010 New START agreement by five years (from 2021 to 2026) to guard against the possibility of an unconstrained nuclear arms race.

Source: <https://www.armscontrol.org>, 04 December 2018.

**Both Russia and China have engaged in large-scale nuclear weapons modernization programs and have kept their respective nuclear workforces up to speed on skills required for building new nuclear warhead designs. They have also increased the role and prominence of nuclear weapons in their national security strategies. They have not followed America's lead in diminishing the role and number of nuclear weapons.**

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Russia routinely practices nuclear attack scenarios in military exercises. It possesses a large and diverse tactical nuclear weapons arsenal and

**OPINION – Jon Kyl and Michael Morell**

**Why the US Needs Low-Yield Nuclear Weapons to Deal with Emerging Threats**

The U.S. Constitution mandates that the government "provide for the common defense," an obligation that has defined much of our professional careers. It has also motivated us to serve on the current National Defense Strategy Commission, whose just-released bipartisan report calls for major improvements to the nation's defense. One of the report's key recommendations is an endorsement of the nuclear modernization programs outlined in the 2018 Nuclear Posture Review.

**United States needs to diversify its nuclear delivery system options on the lower levels of the escalatory ladder, including adding submarine-launched missiles and sea-launched cruise missiles with low-yield nuclear warheads. We must let the Russians know that there will be unacceptable consequences if they ever use such weapons.**

Notably, these proposals include the development of improved options for low-yield nuclear warheads.

As the government's mind-set shifts from waging counterterrorism and counterinsurgency wars to a return of great power competition with Russia and China, nuclear weapons must continue to maintain their deterrent effect. Both Russia and China have engaged in large-scale nuclear weapons modernization programs and have kept their respective nuclear workforces up to speed on skills required for building new nuclear warhead designs. They have also increased the role and prominence

deploys intermediate-range ground-launched cruise missiles in material breach of its international commitments. Russia has coupled these capability developments with a nuclear doctrine that appears, from Russian statements and military exercises, to endorse the pre-emptive use of a nuclear weapon in a conventional conflict to signal Russian resolve and force the United States to back down. In other words, "escalate to de-escalate."

In this way, Russia is intent on exploiting what it perceives as a U.S. nuclear capability gap on the lower levels of the escalatory ladder. That is because a high-yield, long-range U.S. response to Russia's first, limited use of a low-yield

nuclear weapon against a military target is not credible. The Russians believe we are not likely to risk a global thermonuclear war in response to a "tactical" nuclear attack by them. We must change that calculation; we must close the credibility gap. To convince Moscow that there are no possible benefits to limited nuclear escalation, the United States needs to diversify its nuclear delivery system options on the lower levels of the escalatory ladder, including adding submarine-launched missiles and sea-launched cruise missiles with low-yield nuclear warheads. We must let the Russians know that there will be unacceptable consequences if they ever use such

weapons.

The low-yield nuclear options proposed in the 2018 National Posture Review and endorsed by the National Defense Strategy Commission fill this gap in ways that are consistent with U.S. nuclear weapons policy and past practices — and in ways that are fully consistent with America’s treaty obligations. These are not novel nuclear weapons. The short-term fix includes a relatively simple modification of an existing nuclear warhead for a submarine-launched ballistic missile. In the long run, the National Posture Review proposes developing and deploying a sea-launched cruise missile. The United States had such capability for decades but retired it at the beginning of this decade when the nation’s assumptions about international security were more optimistic — in hindsight too optimistic.

Some argue that such weapons would make nuclear war more likely, but the truth is just the opposite; Russia’s use of nuclear weapons is more likely if we don’t develop submarine- and sea-launched low-yield weapons. Others argue that the development of such U.S. weapons would lead to a nuclear weapons arms race. But the race is already in progress and America is playing from behind, hindered by self-imposed constraints. Yet another group of advocates argues that the weapons are too expensive, but nuclear weapons would account for only about 6 percent of the defense budget at a peak of nuclear modernization — a wise investment, given that they are the ultimate national security guarantee.

Successive defense secretaries from both Republican and Democratic administrations have identified nuclear deterrence as the department’s top priority. That’s because U.S. nuclear capabilities make essential contributions to preventing both nuclear and nonnuclear aggression and to maintaining the confidence of

America’s allies. These capabilities are essential to fulfilling the government’s constitutional obligations. As Defense Secretary Mattis has said, “America can afford survival.”

Source: <https://www.dallasnews.com>, 03 December 2018.

OPINION – Victor Nian

**Nuclear Power becomes Critical to Arctic Dominance**

For many, the Northeast Passage through the Arctic could one day be a ‘Northern Suez Canal’. While icy waters have frozen such dreams, recent advances in nuclear technology might finally unlock the full economic potential of the once-daunting Arctic waters.

There is no shortage of interest in the High North. In October, the Trump administration in the U.S. approved a project to extract oil from beneath the Beaufort Sea, though melting ice has since forced changes to those plans.

That same melting ice, while raising major environmental concerns, simultaneously creates other possibilities: among them, the prospect of dramatically shortened sea routes between Europe and Asia which could cut transit times by two weeks compared to the Suez Canal passage. Those reduced travel times translate to savings of 40% on both fuel and shipping costs, while lowering CO2 emissions by 52%.

However, the Northern Sea Route (NSR) along the Russian Arctic coast — a key leg of the Northeast Passage — has historically been traversable only from July to October. It has mainly been used by domestic Russian players, and requires the use of icebreakers and specially equipped ‘ice class’ vessels. In short, a thriving NSR has been nothing more than a dream, even with the melting ice, because it’s simply impossible to sail in the region for most of the year.

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**Going Nuclear:** New technologies, however, present one possible solution: nuclear-powered ships. The concept isn't new. Russia, for instance, has used nuclear power on its icebreakers since the 1970s. However, the reactors of these early ships (at 90-170 MWt) weren't strong enough to allow bigger ships to power through the thickest ice sheets. The icebreakers were just 30 metres wide at most, with a displacement of 25,000 tonnes, and could only clear the way for small freighters of up to 70,000 tonnes.

But a new generation of icebreakers could break through those limitations. These ships can leverage 175-315 MWt of energy and are almost 50 metres wide, with a displacement of 70,000 tonnes that would meet the needs of the biggest tankers. These ships will make the passage navigable all-year round.

Some of these new icebreakers could be operational as early as 2020. The technology they rely on – small modular reactors (SMRs) – could also help solve the second big problem of traversing these waters: a lack of coastal infrastructure. The reactors generate about 110MWe, compared with the 1GWe of classic reactors, and don't require power lines which are practically impossible to construct across hundreds of miles of Arctic terrain.

**A Boon to Trade?:** Designed "for efficient operation and enhanced safety", SMRs have the potential to become economically competitive. They can power ports and isolated communities, while supporting search and rescue posts. This shift to mobile nuclear power generation is already underway: the Akademik Lomonosov, the first

functional floating nuclear power plant, is set to become operational in 2019 and provide energy for the remote port town of Pevek in Chukotka in Russia's far east.

Rosatom says its nuclear-fuelled icebreaker fleet has already escorted as much as 7.3 million tonnes of cargo through the NSR, and projects up to 80 million tonnes transported annually by 2030. These figures are a far cry from

the Suez Canal (which welcomes one billion tonnes of cargo per year), but the promise of fewer days in transit along with "no queues and no pirates" would create new opportunities for Asia in terms of importing LNG from Russia and facilitating exports to Europe.

According to the UK Government Office for Science, the NSR would also create commercial opportunities for British ports, which could serve as transit hubs to transfer goods from conventional ships to ice class vessels.

**The West is Missing out on the Arctic Age:** But despite this British interest, Western countries are some way behind. China and Russia are investing billions in the development of the NSR, with similar progress not being seen in the alternative Northwest Passage off the coast of Canada. While a Danish ship, the Vesta Maersk, was the first of a new 42,000 ton ice-class vessel to sail the NSR in late September

2018, the Chinese have been sending smaller cargo vessels of up to 19,000 tons through the passage since 2013.

Russia occupies a leading position in small nuclear technologies more generally, and is already marketing its on-shore and floating plants based on 55MWe and 6.6MWe SMRs. China is

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expected to come up with its own indigenous floating 50 MWe SMR by 2020 and on-shore 100 MWe systems in the coming decade. These countries will have a head-start once the scramble for the Arctic begins in earnest.

The new Arctic Age presents opportunities, but it also raises serious concerns. Nuclear power could help address the environmental challenges that are causing the ice to melt in the first place. The authors of 'The Future of Nuclear Energy in a Carbon-Constrained World', a MIT study published in September, say that unless nuclear energy is meaningfully incorporated into the global mix of low-carbon energy technologies, the climate change challenge will be more costly and difficult to solve.

The study analyses the reasons behind the stall of nuclear energy capacity, which accounts for just five per cent of global primary energy production. Nuclear's potential is essential for a decarbonised energy future in many regions, said Jacopo Buongiorno. ... More than any other region, the Arctic is being transformed by the real and tangible impact of climate change. With the ice sheets retreating and SMRs becoming a staple of ice-breakers, using low-carbon nuclear energy to make the NSR accessible year-round offers a responsible means of unlocking a shorter global shipping routes.

Source: <https://oilprice.com>, 11 December 2018.

**NUCLEAR STRATEGY**

**ISRAEL**

**Israel Must Reevaluate its Policy of Nuclear Ambiguity**

Given the upheavals cascading throughout the Middle East since 2011, Israel now faces a unique

dilemma, as this ever-volatile region could slip irretrievably into a still deeper level of chaos. If Israel is to remain secure in such an environment,

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it will have to reevaluate its policy of deliberate nuclear ambiguity. To date, the "bomb-in-the-basement" policy has made good sense for Israel. Both friends and foes recognize that Israel possesses significant nuclear capabilities that are both survivable and capable of penetrating enemy defenses. Indeed, for adversaries not to acknowledge these capabilities would require a self-imposed intellectual deficit. But what should Israel do about its nuclear posture going forward? How should this ambiguous stance be adapted to the threats of still-impending Middle Eastern/

**In the arcane world of Israeli nuclear deterrence, it can never be adequate that enemy states simply acknowledge the existence of the Jewish state's nuclear arsenal. Rather, these states must believe that Israel holds usable nuclear weapons, and that Jerusalem would be willing to employ them in certain circumstances.**

North African revolutions, a nuclear Iran, and Israel's more or less constant concern about negotiating agreements with state and sub-state (terrorist) organizations?

Conventional wisdom assumes that credible nuclear deterrence is somehow an automatic

consequence of merely holding nuclear weapons. By this argument, removing Israel's nuclear bomb from the "basement" would elicit new waves of global condemnation without offering any commensurate benefits. But conventional wisdom is not always wise. In the arcane world of Israeli nuclear deterrence, it can never be adequate that enemy states simply acknowledge the existence of the Jewish state's nuclear arsenal. Rather, these states must believe that Israel holds usable nuclear weapons, and that Jerusalem would be willing to employ them in certain circumstances.

A basic point now warrants reiteration. Israel is imperilled by existential threats that fully justify its possession of nuclear weapons and that require a correspondingly purposeful strategic



doctrine. Without such weapons and doctrine, Israel cannot survive over time, especially if neighbouring regimes become more adversarial, more jihadist, and/or less risk-averse. For Israel, merely possessing nuclear weapons, even when fully recognized by enemy states, can never automatically ensure successful deterrence. Though possibly counter-intuitive, a selective and nuanced end to deliberate ambiguity could substantially improve the overall credibility of Israel's nuclear deterrent.

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The information that should be released, limited yet explicit, would centre on major and interpenetrating issues of Israeli nuclear capability and decisional willingness. Sceptics will likely disagree. It does, after all, appear reasonable to assert that nuclear ambiguity has worked so far. Arguably, while Israel's current nuclear policy has done little to deter multiple conventional terrorist attacks, it has succeeded in keeping the country's enemies, whether singly or in collaboration, from mounting any authentically existential aggressions. But as Karl von Clausewitz observed in his classic essay "On War," there comes a military tipping point when "mass counts." Israel is very small. Its enemies have always had a huge advantage in terms of "mass." Perhaps more than any other imperilled state on earth, Israel needs to steer clear of such a tipping point.

**To be effectively deterred, a nuclear Iran would need to be convinced that Israel's atomic weapons were both invulnerable and penetration-capable. Any Iranian judgments about Israel's capability and willingness to retaliate with nuclear weapons would depend largely upon prior knowledge of these weapons, including their degree of protection from surprise attack as well as their capacity to punch through Iranian active and passive defenses.**

An integral part of Israel's multi-layered security system lies in effective ballistic missile defenses, primarily the Arrow. Yet even the well-regarded and successfully tested Arrow, augmented by the newer, shorter-range and systematically integrated operations of Iron Dome, David's Sling,

and related active defenses, could never achieve a sufficiently high probability of intercept to protect Israeli civilians. No system of missile defense can ever be entirely "leak-proof," and even a single incoming nuclear missile that somehow managed to penetrate Arrow or its corollary defenses could conceivably kill tens or perhaps hundreds of thousands of Israelis.

Leaving aside a jihadist takeover of nuclear Pakistan, the most obviously unacceptable "leakage" threat would come from an eventually nuclear Iran. To be effectively deterred, a nuclear Iran would need to be convinced that Israel's atomic weapons were both invulnerable and penetration-capable. Any Iranian judgments about Israel's capability and willingness to retaliate with nuclear weapons would depend largely upon prior knowledge of these weapons, including their degree of protection from surprise attack as well as their capacity to punch through Iranian active and passive defenses. A nuclear weapons-capable Iran may already be a fait accompli. For whatever reasons, neither the international community in general nor Israel in particular has managed to create sufficient credibility concerning timely pre-emptive action. Such a critical defensive action would require complex operational capabilities and could generate Iranian counter-actions that could have a very significant impact on the entire Middle East.

It is likely that Israel has already undertaken major steps in cyber-defense and cyber-war, but even the most strenuous efforts in this direction would not be enough to stop Iran altogether. The

sanctions levelled at Tehran over the years have had an economic impact, but have had no determinable effect in terms of halting Iranian nuclearization or Tehran's enhancements of intercontinental ballistic missile testing. A nuclear Iran could decide to share some of its nuclear components and materials with Hezbollah or with other terrorist groups. To prevent this, Jerusalem would need to convince Iran, inter alia, that it possesses a range of usable nuclear options. Jerusalem should now be calculating (vis-à-vis a prospectively nuclear Iran) the degree of subtlety with which it should consider communicating key portions of its nuclear status.

Certain general details could be released about the availability and survivability of lower-yield weapons. Naturally, Israel should never reveal any specific information about its nuclear strategy, hardening, or yield-related capabilities. It is important to bear in mind that an Israeli move from ambiguity to disclosure would not necessarily help in the case of an irrational nuclear enemy. It is possible that certain elements of the Iranian leadership might subscribe to certain end-times visions of a Shiite apocalypse. By definition, such an enemy would not value its own continued national survival more highly than any other preference or combination of preferences. Were its leaders to be or to become non-rational, Iran could effectively become a nuclear suicide-bomber in macrocosm. Such a destabilizing prospect is improbable, perhaps even at the very outer fringes of plausibility, but it is not inconceivable. A more-or-less similar prospect exists in already nuclear and distinctly coup-vulnerable Pakistan.

To protect itself against military strikes from irrational enemies, particularly attacks that could carry existential costs, Israel will need to reconsider virtually every aspect and function of its nuclear arsenal and doctrine. Removing the bomb from Israel's "basement" could enhance

Israel's strategic deterrence to the extent that it would heighten enemy perceptions of the severity of the risks involved. Irrespective of its preferred level of ambiguity, Israel's nuclear strategy must always remain oriented towards deterrence, not war-fighting. The Samson Option refers to a policy that would be based in part upon some implicit threat of massive nuclear retaliation for certain specific enemy aggressions. Israel's small size means, among other things, that any nuclear attack would threaten Israel's very existence and therefore could not be tolerated. A Samson Option

would make sense only in last-resort or near last-resort scenarios. If it is to be part of a credible deterrent, a corresponding end to Israel's deliberate ambiguity is essential.

None of this is meant to suggest that an Israeli movement away from deliberate nuclear ambiguity

would be helpful only on matters specifically involving nuclear threats. If, however, the aggressors were aware that Israel was in possession of a wide array of capable and secure nuclear retaliatory forces, both in terms of range and yield, these enemies would be more likely to be successfully deterred.

In the final analysis, specific and valuable security benefits would likely accrue to Israel as a result of a selective and incremental end to deliberate nuclear ambiguity. The optimal time to begin such an "end" may not yet have come, but it will have arrived the moment Iran or any other obvious foe verifiably crosses the nuclear threshold. If and when that moment arrives, Israel should have already configured 1) its optimal allocation of nuclear assets; and 2) the precise extent to which that configuration should be disclosed. Such preparation could meaningfully enhance the credibility of its nuclear deterrence posture.

A fully recognizable second-strike nuclear force should then be revealed. Of necessity, such a robust strategic force — hardened, multiplied, and

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dispersed — would be fashioned to inflict a decisive retaliatory blow against major enemy cities. Iran or another prospective nuclear adversary, so long as it is led by rational decision-makers, should be made to understand that the costs of any planned aggression against Israel would always exceed any conceivable gains.

To more comprehensively protect itself against potentially irrational nuclear adversaries, Israel still has no logical alternative to developing a conventional pre-emption option. Operationally, there can be no reasonable assurance of success against multiple hardened and dispersed targets. But even an irrational enemy leadership can still maintain national preference orderings or hierarchies that are both consistent and transitive.

Whether or not a prompt or incremental shift from deliberate nuclear ambiguity to express nuclear disclosure will depend upon several complex and interdependent factors. They include the specific types of nuclear weapons involved; the presumed reciprocal calculations of designated enemy leaders (state and sub-state); the expected effects on rational decision-making processes by these enemy leaders; and the expected effects on both Israeli and adversarial command/control/communication processes. Correspondingly, if bringing Israel's bomb out of the "basement" were ever expected to produce selected enemy pre-delegations of nuclear launch authority and/or new and seemingly less stable launch-on-warning procedures, the likelihood of unauthorized or accidental nuclear wars could be increased. It follows that Israel must prepare to continuously upgrade its national military nuclear strategy — in particular its longstanding policy of deliberate nuclear ambiguity.

Source: <https://www.algemeiner.com>, 03 December 2018.

## RUSSIA

### Putin Threatens to Develop Nuclear Missiles Banned by US-Russia Treaty

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A defiant Putin on December 05, 2018 threatened to develop nuclear missiles banned under a treaty with the United States after Washington gave Moscow a deadline to comply with the key arms control agreement. The latest spike in tensions came a day after US Secretary of State Pompeo said Washington would

withdraw from a major Cold War treaty limiting mid-range nuclear arms within 60 days if Russia does not dismantle missiles that the US claims breach the deal.

Putin dismissed Pompeo's statement as a smokescreen, saying Washington had already decided to ditch the INF. "They thought we would not notice," the Kremlin chief said, claiming the Pentagon has already earmarked an amount for the development of missiles banned by the treaty. "We are against the destruction of this treaty. But if this happens, we will react accordingly." Putin said about a dozen countries were now producing mid-range missiles of the type banned by the INF treaty. "Apparently now American partners believe the situation has changed so much that the United States should also have such weapons. "What will be our answer? A simple one: we will also do this," Putin said.

**'Head Off Arms Race':** In Brussels, EU diplomatic chief Mogherini urged Russia and the US to save the treaty, warning that Europe did not want to become a battlefield for global powers once again, as it had been during the Cold War." The INF has guaranteed peace and security in European territory for 30 years now," Mogherini said as she arrived for talks with NATO foreign ministers.

In October 2018, President Trump sparked concern globally by declaring the United States would pull out of the deal and build up America's nuclear stockpile "until people come to their senses". Putin at the time warned that abandoning the treaty and failure to extend another key arms control agreement known as the New START, would unleash a new arms race and put Europe in danger.

On December 03, 2018 the US leader said he wants talks with Putin and his Chinese counterpart Xi Jinping "to head off a major and uncontrollable arms race". Valery Gerasimov, head of Russia's General Staff, said that Moscow would increase the capabilities of its ground-based strategic nuclear arms. "One of the main destructive factors complicating the international situation is how the US is acting as it attempts to retain its dominant role in the world," he said in comments released by the defense ministry. "It is for these purposes that Washington and its allies are taking comprehensive, concerted measures to contain Russia and discredit its role in international affairs."

**'Ballistic Missiles':** Signed in 1987 by then US president Reagan and Gorbachev, the last Soviet leader, the INF resolved a crisis over Soviet nuclear-tipped ballistic missiles targeting Western capitals. But it was a bilateral treaty between the US and the then Soviet Union, so it puts no restrictions on other major military actors like China.

Pompeo said at a meeting with fellow NATO foreign ministers on December 04, 2018 that there was no reason why the US "should continue to cede this crucial military advantage" to rival powers. NATO said it was now "up to Russia" to save the treaty. The Trump administration has complained of Moscow's deployment of Novator 9M729 missiles, which Washington says fall under the treaty's ban on missiles that can travel

distances of up to 5,500 kilometres (3,400 miles). The nuclear-capable Russian cruise missiles are mobile and hard to detect and can hit cities in Europe with little or no warning, according to NATO, dramatically changing the security situation on the continent.

US-Russia ties are under deep strain over a number of crises including accusations Moscow meddled in the 2016 US presidential election. The two Cold War enemies are also at odds over Russian support for Bashar al-Assad's regime in Syria's civil war, and the conflict in Ukraine. Washington on December 04, 2018 promised Russia more "pain" if Moscow did not release three Ukrainian vessels and 24 sailors captured off Crimea in November 2018.

Source: <https://www.ndtv.com>, 05 December 2018.

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## BALLISTIC MISSILE DEFENSE

### INDIA

#### India Test Fires Nuclear Capable Agni-5 Missile, 2nd Test in Six Months

Indigenously developed surface-to-surface ballistic missile Agni-5 has been successfully test-fired from Dr Abdul Kalam Island off Odisha coast, according to reports. The surface-to-surface missile having a strike range of 5,000 km was launched at 1.30 p.m. from the ITR in Bhadrak district, said Defence Ministry sources. This is the seventh trial of the indigenously-developed surface-to-surface missile, they further added.

Agni-5 is a three stage missile and is 17 metre tall and 2 metre wide. It is capable of carrying 1.5 tonne of nuclear warheads. "The missile was launched with the help of a mobile launcher from launch pad-4 of the ITR at Dr Abdul Kalam Island in the Bay of Bengal on December 10, 2018 afternoon," said a defence source. "It was an user associated trial. Strategic force command along



with DRDO scientists conducted it,” the source added.

During this trial, the flight performance of the missile was tracked and monitored by radars, tracking instruments and observation stations, said the source. “The high-speed on-board computer and fault-tolerant software, along with robust and reliable bus guided the (Agni-5) missile flawlessly (during the test),” an official said.

The missile is programmed in such a way that after reaching the peak of its trajectory, it turns towards the earth to continue its journey to the target with an increased speed, due to the earth’s gravitational pull, and its path precisely directed by the advanced on-board computer and inertial navigation system. As the missile enters the earth’s atmosphere, the atmospheric air rubbing its outer surface skin raises the temperature to beyond 4,000 degree Celsius. However, the indigenously-designed and developed heat shield maintains the inside temperature at less than 50 degree Celsius.

Finally, commanded by the on-board computer with the support of laser gyro-based inertial navigation system, micro inertial navigation system (MINS), fully digital control system and advanced compact avionics, the missile hit the designated target point accurately, meeting all mission objectives, the sources said. The ships located in mid-range and at the target point tracked the vehicle and witnessed the final event. All the radars and electro-optical systems along the path, monitored the parameters of the missile and displayed them in real time.

The first two flights of Agni-5 in 2012 and 2013 were in open configuration. The third, fourth and

fifth launch were from canister integrated with a mobile launcher, that enables launch of the missile in a shorter time as compared to an open launch. The nuclear capable missile is expected to be inducted into India’s Strategic Forces Command

soon and this was its third successful test this year. The last test was held in June 2018.

Unlike other missiles of the series, Agni-5 is the most advanced with new technologies in terms of navigation and guidance, warhead and engine, a DRDO official had said in

June 2018. The missile has a payload capacity of 1,500 kg of high-explosive warhead and once inducted in the military, India will join an exclusive club of countries like the US, Russia, China, France and Britain which have intercontinental ballistic missile capabilities. The missile is being inducted

at a time when India’s neighbourhood is witnessing evolving security threats. In its armoury, India currently has Agni-1 with 700 km range, Agni-2 with a 2,000-km range, Agni-3 and Agni-4 with 2,500 km to more than 3,500-km range. The

first test of Agni V was conducted on April 19, 2012.

Source: <https://economictimes.indiatimes.com>, 10 December 2018.

## **JAPAN**

### **Is Japan’s Ballistic Missile Defense Too Integrated with the US?**

Japan runs the risk of entrapment but seems to accept that fate willingly. Japan was among the first countries to participate in the U.S.-led BMD project and decided to introduce its own BMD system in 2003. BMD is a highly integrated system with satellite radars to detect a missile and

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address it using a multi-layered anti-ballistic missile system. However, so far Japan's BMD cannot possibly function without U.S. technological and military capabilities, and most of Japan's BMD developments are predicated on the assumption that the U.S. military will remain a key partner. Over the course of 15 years since the system's introduction, not only has BMD been an effective tool to strengthen the U.S. alliance and internal defensive capabilities, but also it has created a platform resulting in a highly complex integration of the

**So far Japan's BMD cannot possibly function without U.S. technological and military capabilities, and most of Japan's BMD developments are predicated on the assumption that the U.S. military will remain a key partner. Over the course of 15 years since the system's introduction, not only has BMD been an effective tool to strengthen the U.S. alliance and internal defensive capabilities, but also it has created a platform resulting in a highly complex integration of the two militaries.**

two militaries. Japan can no longer say no to the United States — not just because of the broader alliance relationship but because of overreliance on and integration with the U.S. military when it comes to defending Japan against ballistic missiles.

BMD has served Japan's strategy very conveniently, enabling Japan to join the regional offense-defense arms race despite its pacifist constitution. The nature of BMD as a defensive system is a perfect fit for Japan's strategy of "exclusively defense-oriented defense," under which Japan has focused on defensive capabilities while relying on the U.S. nuclear umbrella. In a similar vein, BMD also strengthens the architecture of the U.S.-Japan security alliance — known as the "Sword and Shield System." Along with Japan's long-standing emphasis on the alliance as a crucial part of its security policy, BMD serves not only maintain the alliance but also strengthen it.

**Japan thus far has developed only ground-based radars, Aegis Destroyers' radar, and Airborne Early Warning, which are helpful only in tracking missiles after a missile is launched. Thanks to the very short action time after a missile launch, a swift exchange of information to detect and track the missile is crucial, which necessitates both the use of U.S. satellites and enhanced interoperability to a substantial degree.**

This is all the more crucial because, since the 1990s, Japanese policymakers have been

concerned about potential "abandonment" by the United States after the end of the Cold War and the seeming decline in the U.S. geopolitical interests in the Asia-Pacific. ...Given this fear, it's interesting to note that BMD in Japan cannot function without U.S. military capabilities. The United States possesses Early Warning Satellites with the Space-Based Infrared System (SBIRS), operating in earth orbit, which cost more than \$11 billion. The SBIRS allows the United States to constantly monitor the Asia-Pacific region,

including North Korea, and detect any sign of potential launches. Japan does not yet possess such capabilities and hence receives information from the United States. Japan thus far has developed only ground-based radars, Aegis Destroyers' radar, and Airborne Early Warning, which are helpful only in tracking missiles after a missile is launched. Thanks to the very short action time after a missile launch, a swift exchange of information to detect and track the missile is crucial, which necessitates both the use of U.S. satellites and enhanced interoperability to a substantial degree.

***Military Integration from an Operational Perspective:*** To ensure effective functionality of BMD and serve the ever-growing necessity of maintaining the security alliance, Japan has made substantial efforts, leading to a seemingly excessive degree of military integration. First, with the revision of the U.S.-Japan Roadmap for Realignment Implementation in 2006, the limitation on the number of annual joint military

training and exercises was eliminated, increasing the number of joint exercises. This goes in tandem with widening and deepening consultations and coordination. In terms of BMD, the strategy is now almost jointly planned, consulted, and implemented if necessary.

While the so-called two-plus-two meeting (where the defense and foreign affairs ministers from each country meet) has long a major platform for the alliance, now military official-level meeting occurs regularly. Within the framework of the Alliance Coordination Group (ACG), director general, director, and action officer-level meetings take place for military policy coordination. This possible after Japan established its own National Security Council with a similar structure to the U.S. NSC. The underlying legal framework to share classified information was strengthened through Japan's Secrecy Law, substantially increasing the punishment for leaking classified information.

There are various consultation forums under the two-plus-two framework — such as the Security Subcommittee, Subcommittee for Defense Cooperation and Japan-U.S. Joint Committee — which are responsible for planning a strategy and its implementation with a particular focus on North Korea and BMD. Now the two militaries even have a physical platform to consult on a daily basis with the establishment of the Bilateral and Joint Operations Coordination Centre at Yokota Air Base for the purpose of enhancing interoperability regarding air defense and BMD through sharing information between the headquarters of the Japan Self-Defense Forces (JSDF) and the U.S. forces.

There have been a variety of developments and frameworks to enhance interoperability specifically in terms of BMD. Most notably, Japan recently enacted legislation to allow the right of

collective self-defense, which includes 10 provisions in the existing legal framework of the JSDF. The most significant part is arguably the addition of the JSDF's mission to "take necessary measures to destroy ballistic missiles" headed for Japan's allies as well as the protection of U.S. military equipment such as Navy vessels. These changes suggest Japan's readiness to address a missile attack directed toward U.S. military bases in Guam and elsewhere. Furthermore, the decision to intercept missile is not unilaterally made by Japan, as the provision states "when the

request is made by the armed forces of the US." This was also confirmed by former Japanese Defense Minister Onodera.

It is no longer easy to tell the difference between the two militaries regarding BMD, apart from the flag. Japan even repairs and maintains the U.S. military equipment within Japan. At the same time, Japan and

the US jointly develop and use some of the core BMD equipment such as Standard Missile 3 Block IIA (SAM-IIA). Japan recently announced that Aegis destroyers will be equipped with the so-called Cooperative Engagement Capability by 2020, which makes it possible to share information simultaneously with the U.S. sensor and radar network. A Nikkei Asian report says that "CEC will be central to the plans for integrated air-and-missile defense capabilities that the Defense Ministry is drawing up." This further blur the distinction between Japan and the U.S. military regarding BMD.

**Understanding Japan's Emphasis on BMD:** Japan's adherence to BMD is seemingly deep-rooted in Japanese policymakers' minds. Concerned by the absence of any effective defense mechanism against long-range missiles, Japanese policymakers have a history of convincing the Ministry of Finance to squeeze out a substantial sum — even in the midst of the long-term economic recession. The JSDF in general has faced severe

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difficulty legitimizing itself due to Japan's pacifist constitution. The JSDF has thus long been the target of budget reductions. Amid a long-term economic recession, the budget battle has continued to this day, as seen in the recent tussling over the new fighter jet project. However, BMD proves an exception to this rule, given Japan's expected purchase of Aegis Ashore for \$5.4 billion. The BMD budget has virtually never been reduced, even when the Democratic Party of Japan (DPJ) was the ruling party (2009-2012) and had the principal objective of reducing the government's expenses.

Another reason for the aggressive pursuit of BMD, at least in the eyes of hawkish lawmakers, is the system's substantial impact on the constraints on Japanese security. As Christopher, W. Hughes argues, "BMD has challenged four key anti-militaristic principles — the non-exercise of collective self-defense, the non-military use of space, the ban on the export of weapons technology, and strict civilian control of the military." It goes without saying that developing BMD simultaneously contributes to "burden-sharing" as an effective mechanism to maintain the U.S.-Japan alliance.

The nature of BMD structure between the United States and Japan — namely, Japan's reliance on the United States — will not change as long as Washington possesses critical components such as early warning satellites. While there was an initiative to develop Japan's own early warning satellite, only technological research had been conducted with a budget of merely 6 million yen. Given the U.S. defense spending on BMD, its technological progress far exceeds that of Japan, and the chances of Japan possessing even an equivalent level of technology are probably slim to none. This is not only about the budget but also Japan's absence of technological cooperation with the United States in this area, probably due to the

U.S. intention to maintain technological bargaining power.

The Japanese legislation to allow the right of collective self-defense, is tantamount to admitting that any danger for the U.S. military forces around Japan is a danger for Japan's national security. Too much integration between the U.S.-Japan military, in the end, resulted in the inclusion of the United States as part of Japan's self-defense mandate.

Looking at the significant development of Japan's defense capability and efforts to maintain the U.S. alliance, with the cruciality of BMD as a major

defense system for Tokyo, there is no turning back now for Japan. This suggests that policymakers in Japan may seek a "threat" to justify the military spending on BMD in the future — whether that is China or Russia, or possibly continues to be North Korea, despite the recent thaw on the

peninsula. Japan's clinging to BMD will have a destabilizing impact on the Asia-Pacific as this behaviour unnecessarily agitates China.

U.S.-Japan military relations have been highly integrated and intertwined, meaning that Japan's security policy risks being in flux depending on U.S. initiatives. This situation is all the more uncertain under the Trump administration. Japan may need to seek a way out of this incremental integration.

Source: <https://thediplomat.com>, 28 November 2018.

## NUCLEAR ENERGY

### CHINA

#### China's Losing its Taste for Nuclear Power

Most beautiful wedding photos taken at a nuclear power plant" might just be the strangest competition ever. But by inviting couples to celebrate their nuptials at the Daya Bay plant in



Shenzhen and post the pictures online, China General Nuclear Power (CGN), the country's largest nuclear power operator, got lots of favorable publicity. A year later, the honeymoon is over.

For years, as other countries have shied away from nuclear power, China has been its strongest advocate. Of the four reactors that started up worldwide in 2017, three were in China and the fourth was built by Beijing-based China National

Nuclear Corp. (CNNC) in Pakistan. China's domestic nuclear generation capacity grew by 24% in the first 10 months of 2018.

The country has the capacity to build 10 to 12 nuclear reactors a year. But though reactors begun several years ago are still coming online, the industry has not broken ground on a new plant in China since late 2016, according to a recent World Nuclear Industry Status Report.

Officially China still sees nuclear power as a must-have. But unofficially, the technology is on a death watch. Experts, including some with links to the government, see China's nuclear sector succumbing to the same problems affecting the West: the technology is too expensive, and the public doesn't want it.

The 2011 meltdown at Japan's Fukushima Daiichi plant shocked Chinese officials and made a strong impression on many Chinese citizens. A government survey in August 2017 found that only 40% of the public supported nuclear power development.

The bigger problem is financial. Reactors built with extra safety features and more robust cooling systems to avoid a Fukushima-like disaster are

expensive, while the costs of wind and solar power continue to plummet: they are now 20% cheaper than electricity from new nuclear plants in China, according to Bloomberg New Energy Finance.

Moreover, high construction costs make nuclear a risky investment.

And gone are the days when nuclear power was desperately needed to meet China's soaring demand for electricity. In the early 2000s, power consumption was growing at more than 10% annually as the

economy boomed and manufacturing, a heavy user of electricity, expanded rapidly. Over the past few years, as growth has slowed and the economy has diversified, power demand has been growing, on average, at less than 4%.

China's disenchantment with nuclear power corresponds with an overall decline in nuclear generation elsewhere in the world. Utilities are retiring existing plants and have stopped building new ones. If China, too, gives up on nuclear, it could sound the death knell for a steady, carbon-free energy source that many see as crucial to slowing climate change.

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### ***Fukushima Changed Everything:***

China's energy planners launched its nuclear industry in the 1980s with the construction of plants like Daya Bay. In 2005 the country began a massive building spree that was intended to solve persistent energy shortages and combat

worsening air pollution from the country's numerous coal plants. By 2009, government planners expected 2020 nuclear capacity to be 10 times what it was in 2005.

Then the Fukushima disaster happened. China's leaders watched in shock as the biggest utility in

one of the world's most advanced industrial countries proved powerless to prevent a series of meltdowns. They knew that if a similar accident occurred in China, the damage wouldn't be limited to the explosion and nuclear fallout. Such an event would call into question the government's competence. ... Within days of Fukushima, nuclear reactor construction in China was frozen. When building resumed months later, after a wave of inspections, Beijing insisted that future nuclear power projects adopt more advanced designs with extra safety features.

The damage to public confidence, however, had already been done. In 2013 over a thousand people assembled in Jiangmen, east of Hong Kong, to decry a planned uranium fuel plant. Within days the state-run project was scrapped. In 2016 local officials suspended preliminary work on a site in Lianyungang, in northeastern Jiangsu province, after an uproar caused by revelations that it might host a recycling plant for spent nuclear fuel. In the wake of that protest, China's State Council amended its draft regulations on nuclear power management, requiring developers to hold public hearings before siting projects.

**Sticker Shock:** Last June two of the world's most advanced reactors began operating in China: a US-designed AP1000 and a French-German EPR. In theory, these reactors are at greatly reduced risk of a Fukushima-style accident. At the Japanese plant, tsunami waves swamped the backup generators needed to keep coolant pumps running, and the catastrophic loss of coolant caused three of the plant's six reactors to melt down. The AP1000 design stores water above the reactor that can

be gravity-fed to keep it cool if the pumps fail. The EPR reactors employ multiple redundant generators and cooling systems to lower meltdown risk.

But adding safety adds cost. At 52.5 billion yuan (\$7.6 billion) for an AP1000 plant with the typical configuration of two reactors, the construction cost

is nearly double that of the conventional technology commonly used in China. ... Coal remains the cheapest source of power in China, but grid operators face demands from the government to use more renewable energy to limit air pollution. With pressure from both directions, even the nuclear plants now operating are underutilized. On average they used 81%

of their generating capacity in 2017, 10% less than five years earlier, making the electricity they produce even more expensive.

**Dwindling Options:** The government has lately said little about nuclear policy. Its official target, last updated in 2016, calls for 58 gigawatts of nuclear generating capacity to be installed by 2020 and for another 30 GW to be under construction. All experts agree China won't reach its 2020 goal until 2022 or later, and pre-Fukushima projections of 400 GW or more by midcentury now look fanciful. Han says he is betting that after the country builds the 88 GW in its 2020 plan, it will move on to other energy sources.

Others believe that China will continue building reactors but at a slower pace than in the past. The country is developing its own advanced design, the Hualong One, and may

want to protect the nuclear industry, including its nascent efforts to export the new reactor. CNNC is building two in Pakistan, and CGN is seeking design approval in the UK. CNNC is also building two at its Fuqing power plant in southeastern Fujian

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province. Construction began in 2015, and CNNC says it will have one reactor operating in 2019, ahead of schedule.

If the Hualong One proves too expensive, China's lingering nuclear hopes will be pinned to its advanced-reactor program—an effort to develop a new generation of technologies that include high-temperature gas-cooled reactors, designs cooled with sodium metal or salt, and smaller versions of pressurized-water reactors. These various designs are meant to be cheaper to build and operate—and much safer—than conventional reactors.

But so far there is little evidence that any of them will solve nuclear's problems. A sodium-cooled reactor completed near Beijing in 2011 has had familiar technical glitches such as problems in its coolant systems. And the rising cost of a pair of high-temperature gas-cooled reactors nearing completion at Shandong Province's Shidao Bay ended plans for a further 18 such reactors at the site.

There's always the possibility of a breakthrough that would make nuclear safe and cheap enough to compete with renewables and coal. But even China's nuclear giants are hedging their bets. Both CGN and the state-owned firm funding China's AP1000 investments rank among the world's top 10 renewable-power operators.

Shifting toward renewables and away from nuclear may be a sound business strategy for these companies. But it could mean one less carbon-free option for a world facing the threat of climate change. If China's nuclear ambitions wind down, it may be the nail in the coffin for the technology's viability elsewhere.

Source: Peter Fairley, <https://www.technologyreview.com>, 12 December 2018.

## GENERAL

### Nuclear Important to Sustainable Energy Mix, Says UNECE Report

All energy sources, including renewables, nuclear and high efficiency fossil fuel with carbon capture and storage, must be considered along with new business models and significant improvements in energy efficiency and productivity to ensure that the energy needed for sustainable development is available and affordable. This is one of the key messages expressed in the Outcome Document of the UNECE's Ministerial Conference of the International Forum on Energy for Sustainable Development that was held in Kiev in November

2018. UNECE published the Outcome Document on December 05, 2018. Nuclear power was for the first time included on the programme of the conference, which is in its ninth year. "Some countries choose to pursue nuclear power with a view that it can play an important role in the global sustainable energy mix," the Outcome Document states,

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noting that nuclear power is the second largest source of low-carbon electricity, after hydropower. It adds that the Intergovernmental Panel on Climate Change's 1.5-degree pathway report estimates that nuclear power generation will need to grow 2.5 times by 2050 if objectives are to be met.

Among its recommendations for priority action, the Outcome Report says that "decisions regarding the future energy mix should be made on the basis of a technology-neutral policy framework where all supply and demand options are recognised for their contribution". It also says that global investment in the energy sector is "running behind what is needed to achieve deep transformation". "Governments should create conducive environments to gain investor trust," it says. "Enhancing open markets and strengthening rule of law can contribute to such trust-building. This applies equally to state-owned investors and foreign and domestic private investors." In 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development and its 17 SDGs. In 2016, the Paris Agreement on

climate change entered into force, with the target of limiting global warming to ‘well below’ 2 degrees Celsius. ...

Opening the workshop, Scott Foster, director of the Sustainable Energy Division of UNECE, said: “I really want to highlight how important this session is for the whole Forum. We’re heading down the path to 4-6 degrees, which is quite enormous, and the question is what the role of nuclear power is going to be. A dialogue on the energy transition is incomplete without considering nuclear power.” Among its other key messages, the Outcome Document states that the current

Nationally Determined Contributions “widely fail” to meet a 2-degree temperature objective “let alone” the Paris Agreement’s goal of keeping warming temperatures well below 2 degrees.

**It was not immediately clear whether a potential Russian reactor would be in addition to the Chinese project, but industry experts say that intensifying talks with a second potential supplier would strengthen Argentina’s hand in negotiations with the Chinese.**

“All nations are committed and are in the process of developing or implementing their approach to achieving their interpretation of sustainable energy and the 2030 Agenda. It is necessary that each country recognises the perspectives and the drivers of the others, that there is not a single approach to the transition but a multitude of approaches,” the Outcome Document states. It adds: “The current political, regulatory, and industrial infrastructure is not ready for deep transformation. Best practices and experiences should be shared and promoted and, where they are insufficient, reconsidered.” Some 80% of today’s energy mix is fossil-based, and fossil energy will remain important, the document says, “a reality that makes it imperative to address the environmental footprint of fossil fuels urgently”.

Source: [https:// www.world-nuclear-news](https://www.world-nuclear-news), 06 December 2018.

## NUCLEAR COOPERATION

### ARGENTINA–RUSSIA

#### Russia Signs Nuclear Deal with Argentina, Competing with China

Russia signed a new nuclear cooperation agreement with Argentina, which is already

negotiating with China about building nuclear reactors. State-owned Russian reactor builder Rosatom said in a statement that the two countries had signed a “strategic document” confirming their partnership in nuclear energy at the G20 summit in Buenos Aires at the weekend. It was signed by Rosatom CEO Likhachev and Argentina Energy Minister Iguacel at a ceremony attended by Russian President Putin and Argentine President Macri.

The deal is not a contract to build nuclear reactors, but a framework agreement like ones Russia has signed with many countries. Such agreements do not always lead to firm contracts and are often reconfirmed every few years. Russia has signed earlier nuclear agreements with Argentina, most recently in 2015. The latest agreement comes shortly

after the head of Argentina’s national investment agency told Reuters last month that Argentina and China aimed to close within days a deal worth up to \$8 billion to build a fourth nuclear power plant in Argentina. No announcement about this was made at the G20 summit, although Argentine media reported that talks are continuing.

The South American country already has three reactors - two German-built, one Canadian-built - which together generate about five percent of its electricity and have combined capacity of 1.6 GW, World Nuclear Association data show. China has already identified a potential site, Atucha, in Buenos Aires province - where two German reactors have been in operation since 1974 and 2014 - and a reactor model, the Chinese-design Hualong.

It was not immediately clear whether a potential Russian reactor would be in addition to the Chinese project, but industry experts say that intensifying talks with a second potential supplier would strengthen Argentina’s hand in negotiations with the Chinese. Rosatom said the new agreement outlined the development of large and small reactors in Argentina, possible joint projects in third-world countries and the possibility of



jointly operating Russian floating nuclear plants. Following the financial troubles of U.S. reactor builder Westinghouse and French Areva - now part of utility EDF - Rosatom has become the nuclear industry's undisputed leader, with an export order book worth \$133 billion.

At home, China has 45 nuclear reactors in operation and about 15 under construction and it wants to build reactors abroad, but it lags way behind Russia in nuclear export. China has built four small reactors in Pakistan and is building two Hualong reactors there. It also has an agreement with French EDF to build a Hualong reactor in Britain but no timing has been set and Argentina looks like China's best chance for a nuclear newbuild deal on another continent.

Source: <https://in.reuters.com>, 04 December 2018.

## URANIUM PRODUCTION

### GENERAL

#### Uranium Markets are Drawing New Interest

Changing fundamentals for uranium have led to a 30 percent rise in prices over the past five months, bringing new attention to this key power generation fuel. Uranium production has outpaced demand for many years, suppressing prices. Front-month uranium futures settlement prices fell from a high of \$73/pound in February 2011 to a low of \$18/pound in December 2017. This low-price environment led several major uranium mines around the world to suspend production. So far in 2018, a further three major

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uranium mines in Canada, the United States and Namibia also halted production, reducing global output by almost 16 percent.

**Nuclear Option:** But while supply has fallen, demand for uranium is growing, particularly from Asia. In November 2018, there were 54 nuclear reactors under construction across the globe, 25 percent of which are in China. China also

plans for a further 43 reactors and is considering adding another 136 in the future. The shift to a more bullish supply-demand balance has seen prices recover. Uranium futures settled at over \$29/pound on November 27, which was also the most active trading day since December 2015. Front-month prices have increased 30 percent over the past five months, which has encouraged greater risk management by electricity producers.

**Restoring Balance:** The uranium market may be entering a period of structural deficit given the level of supply that has been taken off the market and the increase in demand. U.S. energy producers have responded to the potential supply shortfall by increasing purchases and by building stocks. The number of open contracts, or open

interest, in uranium futures has increased as a result, growing 87 percent since prices began to recover in mid-2018. Open interest also extends out for 18 months, providing useful price signals for nuclear plant developers around the world.

Increased volatility and the recent price recovery has led to a significant upturn

in interest in risk management as well as bringing new participants into the uranium market. Fund managers and general investors have noted the recent price activity and are beginning to get

involved in the uranium market for the first time. This increased liquidity is benefiting those electricity producers that are looking to hedge their fuel price exposure. The changing nature of the physical uranium market is ensuring that market participants are increasingly focused on managing price risk.

Source: <https://www.thestreet.com>, 04 December 2018.

## CHINA–RUSSIA

### Russia and Now China Eye Control of the Global Nuclear Industry

The U.S. uranium mining industry has been devastated. In 2018, we expect it will provide less than 2 percent of the uranium that our country's nuclear power plants need to produce 20 percent of our electricity — the lowest U.S. supply level since before the Cold War. This is no accident. We believe this is a deliberate result of

strategies by rival countries to increasingly dominate the global nuclear marketplace and undercut U.S. national and energy security.

More than one-third of uranium imports now come from state-sponsored enterprises in Russia and its satellites. That number is expected to increase as imports from allies such as Canada, Australia, and Namibia decrease. These government-owned industries employ what many would consider to be unfair trade practices that flood the global market with cheap uranium and nuclear fuel. Now China is following in their footsteps.

The Department of Defense-led analysis of the U.S. defense industrial base ordered by President Trump has been released. It describes how the Chinese government leverages its monopoly on certain natural resources to undermine the United States. China's goal, according to many experts, is to force U.S. suppliers in critical industries out of business. The strategy is working. Six uranium

mines in the U.S. have been forced to close in recent years because of artificially low prices. Allied uranium mining has been felled by the same geopolitical weapon. In Canada, only one uranium mine remains in operation, down from four in 2014. Soon, one of the largest uranium mines in Australia will shut down.

And on November 26, 2018 it was announced that Anglo-Australian mining giant Rio Tinto is selling its Rossing mine, one of the world's largest uranium mines, to state-owned China National Uranium Corporation. This mine, located in the Republic of Namibia, has been a major free-market

supplier of uranium since the mid-1970s. CNUC is part of China National Nuclear Corporation, which is also the primary creditor and owner of 25 percent of the neighboring Langer Heinrich mine. State-owned China General Nuclear owns 90 percent of the Husab mine, the other major uranium mine in Namibia. Once Rossing is sold to CNUC, Chinese state-owned

companies will dominate Namibian uranium production.

To make matters worse, the supply of uranium required for our national defense is fast disappearing. According to the U.S. Department of Energy, the U.S. is reliant on a "finite and diminishing" stockpile of highly enriched uranium that is being drawn down more quickly than expected. In fact, the DOE is expected to start purchasing uranium to replenish the stockpile as soon as 2025. How will that be possible without a viable domestic uranium mining industry?

Given that Russia and China have a long history of deploying their state-owned energy industries as tools of foreign policy, the status quo is perilous. That is why we commend the U.S. Department of Commerce for rigorously investigating uranium imports into the U.S. and the effect of those imports on national security.

**China's goal, according to many experts, is to force U.S. suppliers in critical industries out of business. The strategy is working. Six uranium mines in the U.S. have been forced to close in recent years because of artificially low prices. Allied uranium mining has been felled by the same geopolitical weapon. In Canada, only one uranium mine remains in operation, down from four in 2014.**

There is no time to lose. The DOC must move swiftly to complete the investigation. We proposed two common-sense remedies: a quota that, in effect, reserves 25 percent of the U.S. market for domestic uranium and a “buy American” policy for U.S. government purchasers of uranium. The cost of our proposed solutions is expected to be infinitesimal — only 20 cents per month for the average consumer. That is a small price to pay for the ability to thwart the geopolitical ambitions of rival countries that may be trying to influence our national security.

Source: <https://www.washingtonexaminer.com>, 04 December 2018.

## NUCLEAR NON-PROLIFERATION

### SAUDI ARABIA

#### How to Prevent Saudi Arabia from Getting Nuclear Weapons

Skeptics of the 2015 nuclear deal with Iran warned that it could prompt a nuclear arms race in the Middle East. As they predicted, Saudi Arabia has been seeking assistance from the U.S. in obtaining civilian nuclear capabilities, while also speaking—in imitation of the Islamic Republic—of a “right” to enrich uranium, something it pledged not to do in a 2008 agreement with Washington. Were Riyadh to begin such enrichment, it could also produce the fuel necessary for nuclear weapons. Emily Landau and Shimon Stein warn of the dangers inherent in Saudi proliferation, and discuss how the U.S. and Israel should respond.

So long as the motivation to go nuclear remains strong, states are likely to find a way to develop [nuclear] capabilities, even if they have to pay a price for doing so. In Iran’s case, the major motivation for going nuclear is to enhance its hegemonic power in the Middle East.... But in the case of Saudi Arabia, if strong international powers...were to take a harsher stance toward Iran’s regional aggressions and missile

developments and were to cooperate in order to improve the provisions of the [2015 nuclear deal], this would most likely have a direct and favorable impact on Saudi Arabia’s calculations about whether to develop nuclear capabilities.

A decision by the U.S. administration (or for that matter any other supplier) to allow Saudi Arabia to have enrichment capabilities will confront Israel with a dilemma. On the one hand, it has been Israeli policy to do its utmost to deny any neighboring country with whom it does not have a peace treaty the means to acquire and develop a nuclear program. If Israel remains loyal to this approach, it should seek to deny Saudi Arabia enrichment capabilities. In practical terms this would imply making its opposition known in Washington.

On the other hand, given the “tactical alliance” with Saudi Arabia which has been primarily developed in response to the common Iranian threat, Israel could consider sacrificing its long-term interest in denying nuclear capabilities for the sake of its current interest in cultivating relations with the Saudis. Israel, [however], should support the traditional U.S. nonproliferation policies that allow states to have access to nuclear fuel for civilian purposes, while denying them the option to produce it themselves.

Source: <https://mosaicmagazine.com>, 07 December 2018.

## NUCLEAR DISARMAMENT

### GENERAL

#### The Forgotten Premises of Non-Proliferation

In an interview with the daily Neue Osnabrücker Zeitung, German Foreign Minister Maas announced a German-led initiative on global disarmament, warning that technologically advanced weapons can soon transform science fiction into “deadly reality.” This announcement

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came a few weeks after President Trump declared that the United States plans to withdraw from the INF Treaty, which was ratified in 1988. State managers in the European Union recognize the crucial need to embark on universal disarmament even if the current U.S. government remains oblivious.

For about five decades during the Cold War, a nuclear arms race between the Soviet Union and the United States constantly threatened the peace and security of the world. However, advances in the destructive capacities of military technologies, which drastically raised the cost of nuclear wars in economic and human terms, produced a mutual deterrence between the two leading superpowers. This political reality of mutually assured destruction meant that the line of demarcation between victory and self-annihilation is extremely thin. Hence, observing the magnitude of the destructive capacity of nuclear weapons, both superpowers became increasingly aware of the importance of mutual reduction of their nuclear stockpiles.

**Over the past five decades, none of the NPT-designated nuclear weapon states has meaningfully engaged in negotiations to complete disarmament of their nuclear weapons. Worse, they have set agendas to enhance and modernize their nuclear capabilities at enormously high costs.**

***Gloomy Prospects for Nuclear Disarmament:*** Prior to the implementation of the INF Treaty, another crucial international instrument—the Treaty on the NPT—has served as the cornerstone of the global nuclear non-proliferation regime. The NPT provides legal and technical mechanisms to facilitate the pursuit of nuclear disarmament by the nuclear-weapon states. More importantly, Article VI of the treaty legally obligates five nuclear states namely, United States, Russia, China, France, and the UK to “complete disarmament under strict and effective international control.”

Over the past five decades, none of the NPT-designated nuclear weapon states has meaningfully engaged in negotiations to complete disarmament of their nuclear weapons. Worse, they have set agendas to enhance and modernize their nuclear capabilities at enormously high costs. For instance, modernizing the U.S. nuclear arsenal will cost an estimated \$1.7 trillion over

the next 30 years, which is equivalent to the GDP of Canada! Hence, the biggest violators of the core tenets of the NPT are the five designated states who possess nuclear weapons.

The NPT-designated countries are not the only ones who continue to violate the treaty. Those who have failed to join the treaty in the first place have, with the exception of North Korea, have escaped the repercussions of failing to join such an important international treaty. India, Pakistan, and Israel are non-signatories of the NPT that possess nuclear weapons, but international efforts at disarming them have been largely in vain.

In July 2017, over 120 nations adopted the international treaty banning possession of nuclear weapons by the nine nuclear weapon states. This attempt at getting such a historic resolution approved in order to universally ban possession of nuclear weapons by all UN member states was scuttled by the nuclear-weapon states themselves.

***Impediments to Denuclearization of the Middle East:*** In 1974, Iran formally presented the proposal for establishing the Middle East nuclear-weapons-free-zone in a resolution submitted to the United Nations General Assembly with Egypt as a co-sponsor. Since then, despite numerous UN resolutions to create a Middle East free of weapons of mass destruction (including nuclear warheads), Israel remains the single state in the region to have gone nuclear.

The Iran nuclear deal was a step forward in terms of nuclear non-proliferation. As President Barack Obama said, “the Iran deal is the most robust and intrusive inspections and transparency regime ever negotiated for any nuclear program in history.” The regionalization of the Iran deal could have been a great step toward nuclear weapon free zone in the Middle East.

Instead, the U.S. withdrawal from the Iran nuclear deal limited the possibilities of creating a Middle East free from nuclear weapons. The “withdrawal



doctrine” of President Trump’s administration, which has led to pulling back from effective arms control agreements along with his administration’s plans to modernize U.S. nuclear arsenal, is inimical to the premise of both regional and universal disarmament. For the first time since President Truman, a U.S. president has so blatantly dismissed the premise of reducing nuclear arsenals.

In today’s world, sober political analysts now agree that possession of nuclear weapons—once an assurance of security—barely does anything to protect countries from threats and insecurities.

Hence, further modernization of nuclear armaments will only serve to undermine the peace and stability of this planet. It will also push the world toward a cataclysmic great powers conflict that is so reminiscent of the outdated Cold War mentality.

The difference, however, is that in the context of the Cold War, the polarized international politics and the constant threats of nuclear annihilation focused peace efforts increasingly on law and adjudication. The NPT was one such conspicuous result. In contrast, the “withdrawal doctrine” of the Trump administration is pushing the world to the brink of a new nuclear arms race. Nothing endangers the planet more than nuclear weapons. Only a renewed effort to negotiate nuclear disarmament and non-proliferation agreements can reduce this urgent threat.

Source: [https:// www.irrawaddy.com](https://www.irrawaddy.com), 17 September 2018.

**NUCLEAR SAFETY**

**GENERAL**

**Sixty Years Ago Today: IAEA Released its First Safety Standard**

The IAEA Safety Series No. 1 is the first publication the IAEA ever released. It was on December 05, 1958, barely a year after its establishment, when

the IAEA released its first publication: the Safety Series No. 1 ‘Safe Handling of Radioisotopes’. Published exactly 60 years ago, this was the first of what today is the IAEA Safety Standards series.

“The IAEA safety standards are the global reference that organizations and governments can use to protect people and the environment from harmful effects of ionizing radiation,” said Delattre, head of the IAEA’s Safety Standards and Security Guidance Development Section. “They are the benchmark based on which authorities can establish high levels of protection.” Up until 1996,

**Up until 1996, the Safety Series consisted of individual publications focused on principles, codes of practice, regulations, guidance, data, manuals, and reports from panels of experts. In 1997, the Safety Series were superseded by the IAEA Safety Standards series, whose publications focus on requirements and recommendations that —although not legally binding— are based on internationally agreed principles.**

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although not legally binding— are based on internationally agreed principles.

Safety standards and supporting technical documents cover all areas relevant to safety related to a wide range of nuclear material and facilities. The IAEA works closely with governments and organizations around the world to develop these standards. These reflect not only the opinion of IAEA experts and staff, but also of representatives of Member States, who review and agree on their content.

Over the past 60 years, the Agency has published over 400 books under the Safety Series and later the Safety Standards Series, which are among its most read publications, assisting authorities in Member States in upholding nuclear and radiological safety. “Back in those days, the Agency’s publication programme was an important way to facilitate knowledge exchange

between countries,” said Katherine Asfaw, safety standards specialist at the IAEA. “If you come to think of it, there weren’t many ways of sharing scientific knowledge; there was no internet.”

Source: <http://www.iaea.org>, 05 December 2018.

## NIGERIA

### Nigeria becomes HEU Free

More than 1 kilogram of Chinese-origin HEU from the Nigerian Research Reactor-1 (NIRR-1) was returned to China in an operation involving the two countries, the International Atomic Energy Agency and the US Department of Energy’s National Nuclear Security Administration (NNSA).

The process of loading the fuel into a specialised transportation cask, which was then transported by air cargo plane to China, was monitored by IAEA safeguards inspectors and technical experts from China, the Czech Republic, Russia and the USA.

NIRR-1 is a Miniature Neutron Source Reactor (MNSR) designed, manufactured and constructed by the China Institute of Atomic Energy, and has a maximum thermal power level of 30kW. Originally fuelled with 90.2% HEU, the reactor is designed for use in universities, hospitals and research institutes, mainly for neutron activation analysis, production of short-lived radioisotopes, education and manpower development. The NIRR-1 reactor is at Ahmadu Bello University’s Centre for Energy Research and Training.

China National Nuclear Corporation (CNNC) in the 1990s helped Ghana, Nigeria and other countries to build “micro-piles” like NIRR-1 to support nuclear science research and personnel training. In 2006, efforts began to convert Chinese-designed MNSRs from HEU to LEU fuel, enriched to less than 20% U235. Ghana’s GHARR-1 was the first of five such MNSR reactors outside of China to become eligible for conversion and fuel return to China. Conversion of GHARR-1 to LEU was completed in July 2017, and its HEU fuel was returned to China the following month.

Shipment of LEU fuel to NIRR-1 began in October

and the Nigerian reactor reached full-power operation using LEU fuel on 27 November, CNNC said. ...Removal of the last known HEU from Nigeria makes it the 33rd country plus Taiwan to become HEU free. The NNSA said it has removed or confirmed the disposition of more than 6725 kilograms of HEU or plutonium worldwide, helping to reduce the threat of nuclear terrorism.

Source: <http://www.world-nuclear-news.org>, 10 December 2018.

## NUCLEAR TERRORISM

### IRAN

### Hezbollah Once Again Threatens Nuclear Terror against Israel

The Iranian-backed terrorist organization Hezbollah threatened to attack a number of strategic locations in Israel, including the nuclear reactor in Dimona – a threat that constitutes nuclear terrorism – along with a warning, “if you dare attack, you will regret it.

*The Times of Israel* reported that the video appeared to show images and exact locations of the strategic sites, including the reactor, the IDF’s headquarters in Tel Aviv, a number of air force bases, and an oil refinery. In the accompanying message, Hezbollah, in both Arabic and Hebrew, warned Israel against launching an attack against the group or, in return, risk attacks against those high-profile targets.

The warning, issued by the group’s leader Hassan Nasrallah, came a day after an alleged Israeli airstrike on Iranian and Hezbollah targets in southern Syria and near Damascus. It was the first such action since the September 17 incident in which a Russian plane was shot down during an IAF operation in Syria.

Hours before the alleged strike, an Iranian cargo plane, possibly carrying advanced weaponry to Hezbollah, was seen flying from Tehran to Beirut. Cargo planes, regularly used for transporting arms to the terror group, usually unload in Syria contrary to the incident. The aircraft flew to Doha before returning home.

This isn't the first time that Hezbollah has threatened the Dimona reactor. In February 2017, Nasrallah commenting on the fact that Israel was preparing to shut down ammonium tanks in the northern Israeli city of Haifa after Hezbollah had threatened to target them, said of the Dimona facility, "we will turn it into a threat to Israel."

A few weeks later, the terrorist group released a video suggesting that it would target the reactor. Nasrallah, again in August of last year, hinted that his terror group would target the Dimona reactor. According to the United Nations' 2005 International Convention for the Suppression of Acts of Nuclear Terrorism, attacking the Dimona facility could constitute nuclear terrorism. An attack on such a facility could cause the release of radioactive material, which would lead to mass casualties among the surrounding population.

Source: <http://www.thetower.org>, 03 December 2018.

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in pools, dry casks and large tanks at more than 75 sites throughout the country.

A Stanford University-led study recommends that the United States reset its nuclear waste program by moving responsibility for commercially generated, used nuclear fuel away from the federal government and into the hands of an independent, nonprofit, utility-owned and -funded nuclear waste management organization.

**A Tightening Knot:** Over the past four decades, the U.S. nuclear waste program has suffered from continuing

changes to the original Nuclear Waste Policy Act, a slow-to-develop and changing regulatory framework. Erratic funding, significant changes in policy with changing administrations, conflicting policies from Congress and the executive branch and – most important – inadequate public engagement have also blocked any progress. "The U.S. program is in an ever-tightening Gordian knot – the strands of which are technical, logistical, regulatory, legal, financial, social and political – all caught in a web of agreements with states and communities,

regulations, court rulings and the congressional budgetary process," the report says.

The project's steering committee sought to untangle these technical, administrative and public barriers so that critical issues could be identified and overcome. They held five open meetings with

some 75 internationally recognized experts, government officials, leaders of nongovernmental organizations, affected citizens and Stanford scholars as speakers. After describing the Sisyphean history of the U.S. nuclear waste management and disposal program, the report makes recommendations all focused around a

**NUCLEAR WASTE MANAGEMENT**

**USA**

**U.S. Must Start from Scratch with a New Nuclear Waste Strategy**

Thousands of tons of highly radioactive spent fuel are in temporary storage in 35 states, with no permanent solution being discussed. International experts led by Stanford show how to end this status quo. The U.S. government has worked for decades and spent tens of billions of dollars in search of a permanent resting place for the nation's nuclear waste. Some 80,000 tons of highly radioactive spent fuel from commercial nuclear power plants and millions of gallons of high-level nuclear waste from defense programs are stored

**This isn't the first time that Hezbollah has threatened the Dimona reactor. In February 2017, Nasrallah commenting on the fact that Israel was preparing to shut down ammonium tanks in the northern Israeli city of Haifa after Hezbollah had threatened to target them, said of the Dimona facility, "we will turn it into a threat to Israel."**

final goal: long-term disposal of highly radioactive waste in a mined, geologic repository. ...

**Not a New Idea Abroad:** The new, independent, utility-owned organization would control spent fuel from the time it is removed from reactors until its final disposal in a geologic repository. This is not a new idea. Finland, Sweden, Switzerland and Canada all have adopted a similar approach – and their nuclear waste management programs are moving forward. Finland expects to receive its first spent fuel at its geologic repository on the island of Olkiluoto in the mid-2020s. .

Essential to the success of a new organization would be access to the Nuclear Waste Fund. Reassigning responsibility to a new organization – whether controlled by the federal government or nuclear utilities – would require an act of Congress. The report recommends that the Nuclear Waste Fund, more than \$40 billion, be transferred to the new organization over several decades. If the new organization successfully develops a geologic repository, this repository could also be used for highly radioactive defense waste. .

Source: <https://news.stanford.edu/>, 10 December 2018.



Centre for Air Power Studies

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

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